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SYSTEM FOR TABULATING SELECTED MEASURES OF STATE AIR PROGRAMS STATUS

System Sciences, Incorporated

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April 1975

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16. ABSTRACT

A system for tabulating selected measures of state air programs status was developed to provide a method for organizing, summarizing, and presenting within a coherent framework, data from existing reporting systems available to EPA headquarters. The system consists of a framework of measures of selected aspects of state air programs for which data is readily available, a methodology for computing values and scores for these measures, and alternative formats for summarizing and presenting values and scores. A trial run of the system was conducted for all fifty-five state and territorial control programs to demonstrate the manual application of the system. It was concluded that a periodic manual application of the system is feasible but time-consuming. The feasibility of automating the system depends on the extent of system usage and the degree of stability of data items and measures.

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by

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SUMMARY

The System for Tabulating Selected Measures of State Air Programs Status provides a method for consolidating, organizing, summarizing, and presenting within a coherent framework air programs data from existing reporting systems available to EPA headquarters. It is presented as an independent, objective system applicable to state and territorial air pollution control agencies in determining their progress, efficiency, and overall performance in achieving the national ambient air quality standards.

The system was developed within the constraint of using only existing data available to EPA headquarters. It does not purport to be a comprehensive evaluation or priority ranking system of state air pollution control programs. However, the system does provide an overall view of state control performance and need, and makes explicit the relative importance of the various program areas and aspects considered. Existing data permit presentation of a broad picture of national status and trends, and identification of geographic and programmatic problem areas.

The system consists of a framework of measures concerning selected aspects of state air programs for which data are readily available, a methodology for computing values and scores for these measures, and alternative formats for summarizing and presenting values and scores. Comparative analysis is facilitated.

Measures are organized within a four-level structure. At the lowest level of aggregation, sub-indicators are composed of combinations of individual data items drawn from existing data systems. One or more sub-indicators comprise an indicator, one or more indicators comprise a sub-index, and at the highest level of aggregation an index is composed of one or more sub-indices.

The five indices that make up the system measure state performance and need in relation to long-term goals and objectives (ambient air quality standards and emissions reductions), as well as more immediate operational objectives necessary to the accomplishment of goals, specifically:

1. source compliance and enforcement actions,
2. monitoring and reporting air quality and emissions, and
3. completing plans and plan revisions.

Values are computed for each measure. The values can be presented for each index on the first of the suggested output formats. An example of this format is presented below, with states listed alphabetically. Computed values can be converted to scores, which in turn are weighted according to the relative importance of the measures, and combined with the weighted scores of other components to yield a score for the measure at the next level of aggregation. The second output format can be used to present scores at any or all levels of aggregation. Finally, the third output format can be used to present a frequency distribution of the number of states within ranges of computed values or scores for a given measure.

In addition to the three suggested output formats, there are many possible ways of organizing and presenting the results of the system,

Fig. II-8a. Output Format #1, State Values for Index 1

STATE	1. GOAL ATTAINMENT																									
	1.1. TSP						1.2. SO_2						1.3. CO						1.4. O_x				1.5. NO_2			
	1.1.1. AAQI				1.1.2. Em. Reduction	1.1.3 PRMS Flags (# of Stns. Analyzed)	1.2.1. AAQI				1.2.2. Em. Reduction	1.2.3. PRMS Flags (# of Stns. Analyzed)	1.3.1. AAQI				1.3.2. Em. Reduction	1.3.3. PRMS Flags (# of Stns. Analyzed)	1.4.1. AAQI		1.4.2. Em. Reduction	1.4.3. PRMS Flags (# of Stns. Analyzed)	1.5.1. AAQI		1.5.2. Em. Reduction	1.5.3. PRMS Flags (# of Stns. Analyzed)
	1.1.1.1.(a)>Annual	1.1.1.1.(b)≤Annual	1.1.1.1.(a)>24-Hour	1.1.1.2.(b)≤24-Hour			1.2.1.1.(a)>Annual	1.2.1.1.(b)≤Annual	1.2.1.2.(a)>24-Hour	1.2.1.2.(b)≤24-Hour			1.3.1.1.(a)>8-Hour	1.3.1.1.(b)≤8-Hour	1.3.1.2.(a)>1-Hour	1.3.1.2.(b)≤1-Hour			1.4.1.1.(a)>1-Hour	1.4.1.1.(b)≤1-Hour			1.5.1.1.(a)>Annual	1.5.1.1.(b)≤Annual		
Alabama																										
Alaska																										
A. S.																										
Arizona																										
Arkansas																										
Calif.																										
Colorado																										
Conn.																										
Delaware																										
D.C.																										
Florida																										
Georgia																										

depending on the use to which system results will be put and the specific area of interest. Automation of the system would enable presentation of results in a wide variety of ways, in regard to both states and measures of interest.

In developing the system, the goal was flexibility -- in output format as well as in assignment of weights and selection of specific measures and levels of aggregation of interest to the user.

A trial run of the system was conducted for fifty-five state and territorial control programs to demonstrate the manual application of the system. It was concluded that a periodic manual application of the system is feasible, but very time-consuming and subject to errors in calculation. The feasibility of automating the system depends on the extent of system usage and the degree of stability of data items and measures. Partial automation of the system -- specifically, automated computation of the values for selected measures, each drawn from a single data source -- was considered to be the best alternative at this time, subject to a detailed cost feasibility study.

Understanding two additional points is essential to the proper use of the results generated by the system:

1) The system is only as good as the data from which values are calculated. Although there are problems with data validity, completeness, and timeliness, data are expected to improve in quality and quantity in the future. In the meantime, system results should be used with the limitations of the data and information systems in mind.

2) Inherent in any objective system relying solely on quantitative data is the lack of qualitative judgment necessary to interpret and put into proper perspective the quantitative results. Data inaccuracies and unique problems faced by each state constrain the usefulness of these quantitative results, which make up only one of many inputs to EPA's decisionmaking processes.

With these limitations in mind, however, system results can be useful in subjecting comparative analysis and resource priority allocation judgments to the discipline of available data.

INTRODUCTION

Volume I presents a chronological description of the development of the system and an overview of the individual project tasks. Included in this overview are a description of what was done at each step, the rationale for excluding and including individual parameters and measures, problems encountered and their solutions. Basically, it traces system development from its inception, through changes which occurred during its implementation up to its current form.

A detailed description of the final system that resulted is presented in volume II, including alternative output formats, possible uses of the system, and limitations and difficulties in using the system. Volume II has been written so that it can be used separately as a self-contained description of the system and a reference manual on its application and use.

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VOLUME I - DEVELOPMENT OF THE SYSTEM

Introduction

The purpose of the project as stated in the work plan was to develop an independent, objective evaluation system to be applied to control agencies in determining their progress, efficiency, and overall performance in achieving the national ambient air quality standards. Parameters would be identified, evaluation measures would be structured from these parameters, and an evaluation system developed.*

An important constraint on the system was that evaluation parameters had to be drawn from existing data sources and reporting systems accessible to EPA headquarters. For that reason it was decided that an inductive, rather than deductive approach would be most productive. In other words, instead of first developing an elaborate abstract evaluation framework and then investigating sources of data for the evaluation (deductive approach), parameters would be identified from existing data sources, culled, and grouped into categories; on the basis of these parameters, an evaluation system would be designed (inductive approach).

While such an approach probably does not lead, as would the deductive approach, to a comprehensive system for evaluating all possible aspects of air pollution control programs and activities, it does avoid the situation where significant portions of a more ideal evaluation system might not be practical because of extensive data gaps or difficulties in collecting data for all states and territories. The purpose of the project was to provide to EPA's Control Programs Development Division (CPDD) an evaluation system that was (1) applicable to all states and territories, (2) of immediate use to EPA, and (3) capable of being implemented on a regular basis (annually, or for whatever period was desired) with a minimum of effort. Data trends resulting from periodic implementation of the system would also provide increasing administrative and technical insights. The inductive approach, by designing an evaluation system based on data derived from existing nationwide sources, fills these needs.

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* Throughout the report, the term "parameter" is used to refer to an individual data item which describes some aspect of status of activities, while the term "measure" refers to some combination of these parameters by which states are evaluated.

Another consideration that influenced the entire process of developing the evaluation system was the need and desire to involve as many persons as possible who will be users and/or who will be affected in the conceptualization, development, and review of the system. Such extensive participation was considered necessary not only to ensure consideration of all facts relevant to the substance of the system, but also to facilitate implementation of the system.

A. Task 1: Parameter Identification

All potential parameter inputs to the system, their sources, and associated time delay in obtaining the data were identified during Task 1. EPA personnel with knowledge of data banks, reporting systems, published reports, and other data bases currently in existence or projected for the near future were contacted and interviewed. An outline of existing and projected data sources identified in the course of this task is presented below. Published documents are underlined.

EPA Data Sources:

Aerometric and Emissions Reporting System (AEROS) maintained by the Monitoring and Data Analysis Division, Durham, N.C.

- Storage and Retrieval of Aerometric Data (SAROAD)
- National Emissions Data System (NEDS)
- National Emissions Report
- Monitoring and Air Quality Trends Report

Compliance Data System (CDS)

Management-By-Objectives (MBO) Outputs Reporting System

Air Pollution Training Institute (APTI)

Air Programs Manpower Model

Plan Revision Management System (PRMS)

State Air Pollution Implementation Plan Progress Reports

State Implementation Plans

Non-EPA Data Sources:

U.S. Bureau of the Census, Department of Commerce

U.S. Decennial Census and other special purpose censuses
Statistical Abstract of the U.S.
U.S. County-City Data Book

Climatological Data, National Weather Service

Dun and Bradstreet, Dun Market Identifiers (DMI) File

OBERS Projections (1972), Bureau of Economic Analysis (Dept. of Commerce) and Economic Research Service (Dept. of Agriculture)

Appendix I-A presents a list of EPA personnel interviewed in the course of investigating data sources and information derivable from these sources. (The list also includes persons who were asked as a part of tasks 2 and 3, for their input into the development and review of the parameters, the evaluation system and its component indicators.)

The end product of task 1 was a comprehensive list of information bits, data sources, and estimated time delay in obtaining each information bit. This list is included as Appendix I-B.

B. Task 2: Parameter Analysis, Review, and Selection

1. Culling of Parameters

The parameters identified in task 1 were evaluated in the light of the following criteria:

(1) Validity: are the reported data accurate? do they reflect the true state of affairs? are they reliable, e.g., do they reveal logical trends and variations or are there unreasonable fluctuations that indicate inconsistency in data collection procedures or definitions in terms?

(2) Accessibility: are the data reported to a central data collection unit? are the data automated? how difficult, in terms of cost, programming effort, time, requesting procedures, is it to obtain the data? in what formats can the data be retrieved?

(3) Completeness: is sufficient information reported to adequately draw conclusions about a particular aspect of status or activities? is there much data that is collected but not reported to the collection center?

(4) Timeliness: what are the deadlines for reporting data, and are they usually met? what is the extent of time delays expected?

(5) Stability: is the data now collected likely to be collected in approximately the same format and with some regularity in the foreseeable future? What data items or data systems are likely to be added or deleted?

EPA personnel familiar with the parameters, data systems, and data collection processes were questioned in regard to the parameters (see Appendix I-A for list of personal contacts). General findings in regard to each of the criteria as applied to the major EPA data systems are presented below:

(1) Validity: There was a wide range of opinion with regard to the validity of the various data systems. Many reservations were expressed about the validity of the SAROAD data because of problems

with air quality measurement methods and procedures, quality assurance, and site representativeness. However, all agreed that ambient air quality (AAQ) data were essential and that validity of this data would improve as EPA guidelines were issued, quality assurance programs were established, and state and local control agencies became more experienced.

Some regional personnel expressed serious doubts about the MBO data because of problems with definitions of terms and the guesswork involved in state commitments and reporting of outputs. The validity of the MBO data, it was recognized, can be improved in the future with an accurate and efficient CDS in the regional offices and comparable systems (such as EMS) on the state and local level.

Opinions on the validity of the PRMS analysis varied widely making any firm conclusions about the use of PRMS parameters impossible at this point.

Generally, because of the wide variation in opinions on the validity of the various data systems and because of the probability of improvement of the data over time, no parameters were eliminated on the basis of the validity criterion.

(2) Accessibility: Some parameters, specifically those derived from CDS, the manpower model, and air quality monitoring quality assurance systems, were put aside temporarily until projected data or reporting systems were made operational or were equally operational in all regions. Control agency expenditures broken down by functional areas or activities were found to be unavailable without additional data collection efforts (total expenditures per

state are available). MBO outputs #2 through #8 are not required to be reported by state; however, these parameters were left in, pending determination of whether state breakdowns could be obtained from regional offices with a minimum of extra effort.

(3) **Completeness:** Because there is a significant amount of air pollution-related training that is not conducted through the Air Pollution Training Institute, it was felt that training data from the APTI could not be used to evaluate states on the amount of personnel training taking place.

Major reservations were expressed about the completeness of emissions data reported to NEDS. There was general agreement that the completeness of state's emissions inventories varied a great deal, as did the extent of updating NEDS files (new sources or changes in existing sources). Regional personnel generally agreed that a state's own files contained much more information than was submitted to NEDS. However, it was felt that emissions data could not be completely eliminated, that NEDS data would improve over time, and that existing NEDS data to some extent reflected actual changes in emissions. One major problem was the inability to determine to what extent changes in total emissions reported to NEDS were due to changes in emissions of existing sources or to changes in the number of sources on NEDS. Current efforts by NADB should resolve this problem in the near future.

There were also questions as to the relative completeness of AAQ data reported to SAROAD, given the wide range of completeness of monitoring networks in the AQCRs and states. This issue is addressed further in Volume II of this report.

(4) Timeliness: There were problems of varying seriousness with timeliness in relation to all data systems; however, no parameter was eliminated on the basis of this criterion alone. This problem is discussed further in Volume II.

(5) Stability: Generally no significant deletions of data were planned, and personnel contacted could not anticipate what changes might occur in form. Additional data were anticipated with the completion of CDS and the manpower model both of which contain parameters which were included in the list of parameters.

2. Feasibility Study of Automation of the System

A preliminary feasibility study was conducted to determine the advisability of automating all or a portion of the system. Three approaches to system implementation were analyzed: (1) complete automation, (2) partial automation, and (3) manual data preparation and reduction. All the major factors which might be considerations in the practicability of automation were examined. These factors included (1) frequency of update, (2) system utility-user access requirements, (3) need for flexibility, (4) probability of system modification, (5) linkages among existing automated systems, (6) accuracy of calculations, (7) lag time in data flow, (8) needed manpower, and (9) hardware and software needed.

The results of this study and the recommendations emerging from it are included in Volume II, Section E.

C. Task 3: System Development

1. Indicator Construction

Culled parameters were combined to build measures of some aspect of control agency status and performance. These measures were normalized, i.e., related to a norm or standard, so that one state could be compared meaningfully to another. The basic premise was that a state should be evaluated in terms of national goals or objectives, or in terms of its own objectives (not inconsistent with national goals). For example, an air quality improvement measure examines not merely absolute improvements (in $\mu g/m^3$, etc.), but also improvements relative to achievement of the national ambient air quality standards.

2. Conceptual Framework

The next step was to organize the measures into a logical categorization scheme that was to serve as the conceptual framework for the system. Several categorization outlines were developed during the system design stage.

Initial categories followed the lines of control agency functions and activities (Figure I-1). However, the problem of significant overlapping of measures into more than one category combined with the rigid framework revealed this method to be unworkable as an overall view of control agency status. Therefore a new framework was developed based on evaluation schemes used in social research* (see Figure I-2). This categorization distinguishes between the goals of air quality improvement and emissions reductions, and operational objectives of meeting commitments, ensuring source compliance, reporting AQ and emissions data, and completing plans and plan revisions. A measure of need, reflecting the magnitude of the air pollution problem apart

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* See, for example, Edward Suchman's Evaluative Research (1967), and Carol Weiss's Evaluation Research (1971), both published by the Russell Sage Foundation.

Suggested Categories and Subcategories

Outputs

1. Administrative
2. Enforcement
3. Engineering
4. Technical Services

Monitoring

Enforcement

Administrative

Resources

Overall Performance

1. Emissions Reductions
2. Air Quality Improvements

Figure I-1. Categorization Scheme #1

Categorization of Indices

1. **Need**: How great is the present air pollution problem?
    - a. Actual ambient air quality problem
    - b. Emissions and emission sources
    - c. Environmental conditions that exacerbate air pollution
2. **Effort**: What resources are being expended, what actions are being taken in relation to the need?
    - a. Resources expended
    - b. Surveillance/enforcement actions
    - c. Manpower training
3. **Performance**: How well is the agency operating in relation to operational objectives?
    - a. Performance in meeting MBO commitments
    - b. Compliance performance
    - c. Performance in reporting AQ/emissions data
    - d. Performance in completing plans and plan revisions
4. **Adequacy**: What is the agency progress in accomplishing air quality goals (adjusted for population/economic growth, data changes, new sources, meteorological conditions, etc.)?
    - a. Emissions reductions
    - b. AQ improvement
5. **Efficiency**: Cost-effectiveness
    - a. Cost per action taken
    - b. Cost per unit of emissions reduction/AQ improvement
6. **Process**: Tie between effort and result, assumptions made, limitations of evaluation system, lead into the need for subjective evaluation.

Figure I-2. Categorization Scheme #2

from the extent of state efforts and progress, was also added. The six major categories of measures, termed indices, were to be the overall measures of control agency status.

Additional categorization schemes attempted to refine the basic framework. Figure I-3 illustrates how the indices fit into the evaluation process. Emphasis here is on the point in time or period of time for which an index and its component indicators are relevant. Two types of indices were suggested: (1) indices of need, and (2) indices of performance. Further discussions with EPA personnel pointed out the need to distinguish between progress during the most recent period of evaluation (such as the past year), improvement in progress from the previous period to the present period, and long-term cumulative achievement, resulting in eight indices and twenty-four sub-indices (see Figure I-4).

At this point a questionnaire (see Appendix I-C) was sent out to all EPA regional offices and certain headquarters offices asking for comment on the general categories of measures then under consideration. Respondents were asked to weight the relative importance of the measures and to add any additional indicators they felt were relevant. Twenty-three responses were received: 18 from 6 regional offices, 4 from headquarters offices, and 1 from a state control agency. The questionnaire was intended to indicate general consensus as to relevant categories of measures of state performance and need; there was never any intention to use the results in any statistically rigorous manner. In fact, for the majority of categories, there was a great deal of variation in the weights provided by the respondents for any one category and little variation between categories in any

Outline of Steps of State Evaluation System

A. Determine State's Initial Need (at the beginning of the period of analysis)

1. Goal: Attainment of Ambient Air Quality Standards

   PROBLEM: Magnitude of air quality problem that must be solved
   Ambient air quality problem
   Emissions and emission sources
   Environmental conditions that exacerbate air pollution

2. Objectives: Source Compliance
   Minimum required reporting of AQ and emissions
   Completion of plans and revisions

   STATUS: Discrepancy between objectives and actual conditions
   Source compliance status
   Status in reporting AQ/emissions data
   Status in completing plans and revisions

B. Rate State Performance (during the period of analysis)

1. EFFORT: Resources expended during the period in relation to problem at the beginning of the period
   - 1.1. Resources Expended
   - 1.2. Manpower Training (APTI)

2. ACHIEVEMENT: Operational Accomplishments (incremental, cumulative, and rate of accomplishment) in relation to objectives or deficiency at the beginning
   - 2.1. Achievement in Meeting MBO Commitments
   - 2.2. Compliance Achievement
   - 2.3. Achievement in Reporting AQ/Emissions Data
   - 2.4. Achievement in Completing Plans and Revisions

3. GOAL ATTAINMENT: Changes in AQ and emissions during the period in relation to problem at the beginning
   - 3.1. Ambient Air Quality Improvement
   - 3.2. Emissions Reductions
   - 3.3. PRMS

4. EFFICIENCY: Cost-effectiveness of resources expended during the period
   - 4.1. AQ improvement/emissions reduction per dollar of resources expended

C. Rate State's Present Need (at end of period of analysis)

5. PROBLEM: Magnitude of air quality problem that must be solved
   - 5.1. Ambient Air Quality Problem
   - 5.2. Emissions and Emission Sources
   - 5.3. Environmental Conditions that Exacerbate Air Pollution

6. STATUS: Discrepancy between objectives and actual conditions
   - 6.1. Source Compliance Status
   - 6.2. Status in Reporting AQ/Emissions Data
   - 6.3. Status in Completing Plans and Revisions

Figure I-3. Categorization Scheme #3

I. State Performance Indices

  A. Goal: Air Quality Improvement, Emissions Reduction

    1. EFFORT: Resources expended during the period in relation to the air quality problem at the beginning of the period

      1.1. Total Expenditures

    2. GOAL ATTAINMENT: Changes in air quality and emissions during the period in relation to the air quality problem at the beginning of the period

      2.1. Ambient Air Quality Improvement
      2.2. Emissions Reduction
      2.3. PRMS

    3. EFFICIENCY: Cost-Effectiveness

      3.1. Air Quality Improvement Per Dollar of Resources Expended
      3.2. Emissions Reduction Per Dollar of Resources Expended

  B. Operational Objectives: Meeting Commitments, Source Compliance, Enforcement Actions, Monitoring and Reporting Air Quality and Emissions, Completing Plans and Revisions

    4. PROGRESS: Operational accomplishments during the period in relation to operational objectives or deficiencies at the beginning of the period

      4.1. Meeting MBO Commitments
      4.2. Source Compliance
      4.3. Enforcement Actions
      4.4. Monitoring and Reporting Air Quality and Emissions
      4.5. Completing Plans and Revisions

    5. IMPROVEMENT: Progress during the present period in relation to progress during the previous period

      5.1. Meeting MBO Commitments
      5.2. Source Compliance
      5.3. Enforcement Actions
      5.4. Monitoring and Reporting Air Quality and Emissions
      5.5. Completing Plans and Revisions

    6. ACHIEVEMENT: Cumulative operational accomplishments at the end of the period in relation to long-term operational objectives

      6.1. Source Compliance
      6.2. Monitoring and Reporting Air Quality and Emissions
      6.3. Completing Plans and Revisions

Figure I-4. Categorization Scheme #4

II. State Need Indices

   A. Goal: Air Quality Improvement, Emissions Reduction

      7. PROBLEM: Status at the end of the period in relation to air quality and emissions goals

         7.1. Ambient Air Quality
         7.2. Emissions and Emission Sources

   B. Operational Objectives: Source Compliance and Enforcement, Monitoring and Reporting Air Quality and Emissions, Completing Plans and Revisions

      8. DEFICIENCY: Status at the end of the period in relation to long-term operational objectives

         8.1. Source Compliance and Enforcement
         8.2. Monitoring and Reporting Air Quality and Emissions
         8.3. Completing Plans and Revisions

Figure I-4. Categorization Scheme #4

(Continued)

summary statistic (mean, median, mode) of the weights for these categories. The responses, however, did point out a few measures for which there appeared to be a consensus for elimination (such as total land area) or inclusion (such as urban population).

During this same period visits to two EPA Regional Offices were made to discuss the system and the individual measures. Meetings were also held with personnel from two additional Regional Offices and relevant headquarters offices (see Appendix I-A).

On the basis of the questionnaire responses and continuing discussions with EPA personnel, the system was trimmed to five indices and sixteen sub-indices (see Figure I-5). The index "Improvement" compared progress during the present period of evaluation with progress during the previous period. Since for this first demonstration of the system there would be no "previous period of evaluation," the index was dropped temporarily; the index can be reinserted for the second application of the system if desired. The indices "Effort" and "Efficiency" were eliminated because of the questionable validity of using total state expenditures in relation to specific activities or changes in specific aspects.

Many of the indicators eliminated from the original list (such as program expenditures), along with some additional data, were put into a separate section of State Background Information. This section is intended to provide some perspective on state status without serving as a basis for evaluating state performance or need in regard to air pollution control.

Finally, because of the expressed desire of EPA personnel to look separately at state performance and need relative to each of the

A. State Performance Indices

1. GOAL ATTAINMENT: Changes in air quality and emissions during the period in relation to the air quality and emissions problems at the beginning of the period

1.1. Ambient Air Quality Improvement
1.2. Emissions Reduction
1.3. PRMS

2. PROGRESS: Operational accomplishments during the period in relation to operational objectives or deficiencies at the beginning of the period

2.1. Meeting MBO Commitments
2.2. Source Compliance
2.3. Enforcement Actions
2.4. Monitoring and Reporting Air Quality and Emissions
2.5. Completing Plans and Revision

3. ACHIEVEMENT: Cumulative operational accomplishments at the end of the period in relation to long-term operational objectives

3.1. Source Compliance
3.2. Monitoring and Reporting Air Quality and Emissions
3.3. Completing Plans and Revisions

B. State Need Indices

4. PROBLEM: Status at the end of the period in relation to air quality and emissions goals

4.1. Ambient Air Quality
4.2. Emissions and Emission Sources

5. DEFICIENCY: Status at the end of the period in relation to long-term operational objectives

5.1. Source Compliance and Enforcement
5.2. Monitoring and Reporting Air Quality and Emissions
5.3. Completing Plans and Revisions

Figure I-5. Categorization Scheme #5

criteria pollutants, the sub-indices were reorganized to feature the pollutants at the highest possible level of aggregation. Thus, the index "Goal Attainment," which originally was composed of the sub-indices, ambient air quality improvement, emissions reductions, and PRMS flags, each of which was composed of indicators for all the pollutants, was reorganized so that the sub-indices became goal attainment for the pollutants. Each sub-index was composed of indicators of ambient air quality improvement, emissions reduction, and PRMS flags for that pollutant. This categorization scheme is shown in Figure I-6.

3. Weighting System

After the conceptual framework was developed and component sub-indices, indicators, and sub-indicators were constructed, weights were assigned at each level of aggregation according to the relative importance of each component within the whole.

An initial set of weights was developed partly on the basis of responses to the questionnaire (Appendix I-C) and partly based on subjective judgment derived from discussions with various EPA personnel. The system of measures and weights was sent to EPA Regional Offices and to the State and Territorial Air Pollution Program Administrators (STAPPA) for further review and comment. Respondents were asked to substitute their own weights if the weights provided proved unsatisfactory.

Comments were received from four states, all of which dealt with the overall system or the validity of specific measures. No alternative weights were suggested. Therefore the initial set of weights was retained for use in the test run of the system.

However, it is well understood that assignment of weights depends a great deal on the use to which the results of the system will be put.

A. State Performance Indices

1. GOAL ATTAINMENT: Changes in air quality and emissions during the period in relation to the air quality and emissions problems at the beginning of the period

    1.1. TSP Goal Attainment
    1.2. SO_2 Goal Attainment
    1.3. CO Goal Attainment
    1.4. O_x Goal Attainment
    1.5. NO_2 Goal Attainment

2. PROGRESS: Operational accomplishments during the period in relation to operational objectives or requirements at the beginning of the period

    2.1. Meeting MBO Commitments
    2.2. Source Compliance
    2.3. Surveillance and Enforcement Actions
    2.4. Monitoring and Reporting Air Quality (Pollutant-Specific)
    2.5. Monitoring and Reporting Air Quality and Emissions (General)
    2.6. Completing Plans and Revision

3. ACHIEVEMENT: Cumulative operational accomplishments at the end of the period in relation to long-term operational objectives

    3.1. Source Compliance
    3.2. Monitoring and Reporting Air Quality (Pollutant-Specific)
    3.3. Monitoring and Reporting Air Quality and Emissions (General)
    3.4. Completing Plans and Revisions

B. State Need Indices

4. PROBLEM: Need at the end of the period in relation to air quality and emissions goals

    4.1. Ambient Air Quality (Pollutant-Specific)
    4.2. Emissions Sources (General)
    4.3. Emission Reduction Needed (Pollutant-Specific)

5. OPERATIONAL REQUIREMENTS: Need at the end of the period in relation to long-term operational objectives

    5.1. Source Compliance and Enforcement
    5.2. Monitoring and Reporting Air Quality (Pollutant Specific)
    5.3. Monitoring and Reporting Air Quality and Emissions (General)
    5.4. Completing Plans and Revisions

Figure I-6. Categorization Scheme #6

In addition, a good case can be made that any evaluation of state performance must be related to the extent and nature of the problem with which a state is faced. For example, an adequate oxidant monitoring network is much more important than a complete SO_2 network in a state in which ambient O_x levels exceeds standards and SO_2 levels are below standards. Such an argument suggests the need for separate weighting schemes for each state or region, and perhaps weights that vary from one application of the system to the next.

For these reasons, it was decided that while the initial set of weights would be used for the initial demonstration of the system, emphasis would be placed on making explicit what weights were used and making simple the recalculation of scores using alternative weights. A user of the system need not utilize the weights used in the trial run, but may substitute his own. The whole issue of system flexibility is discussed further in Volume II, Section E of this report.

4. Output Formats

The output format depends to a large degree on the use to which system results will be put. Two alternative formats were developed and are described in Volume II, Section D.

Variations within each basic format were developed when interest was expressed in using certain levels of aggregation. Thus format #1 can be used to show all scores for all measures under a given index, a summary of scores for all indices and sub-indices, or computed values (not scores) for measures at the lowest level of aggregation. Similarly format #2 can be used to depict values or scores for any measure at any level of aggregation.

D. Task 4: System Implementation

An initial application of the system was made as a demonstration in order to test the availability of data and make some judgments about the validity of the measures. Data were collected from the various sources. Calendar year 1973 was chosen as the present period of evaluation of those measures using SAROAD and NEDS data. This was the latest complete year for which SAROAD data were available in published form; use of the published reports facilitated comparison with a previous period, calendar year 1972. NEDS emission data generally representative of 1973 were available from NEDS printouts.

Because the MBO system and its outputs were established beginning in FY 75, a different period of evaluation for indicators utilizing MBO data was necessary. MBO commitments and achievements for all states as of the second quarter of FY 75 (ending December 31, 1974) were utilized. This was considered acceptable because MBO data are not combined with other data in any measure, so that there is no inconsistency of time period within any one measure.

The trial run produced some changes in the framework of measures. Some data, such as the MBO outputs #2 through #8, proved unavailable, so that many measures had to be dropped. As a consequence, two sub-indices under each of three indices, 2.4. and 2.5., 3.2. and 3.3., and 5.2. and 5.3. were combined. Sub-index 2.6., Progress in Completing Plans and Revisions, was dropped because it was felt that the completion of plans and revisions was a more long-term process than could be measured for a single period of evaluation. Sub-index 3.4., Achievement in Completing Plans and Revisions, was retained. Finally, sub-index 4.2. Emissions Sources (General) was expanded to include current emissions of each of the pollutants, and was renamed Emissions and Emission Sources. The final outline of the five indices and eighteen sub-indices is presented in Figure I-7.

Description of the trial run procedures is given in Volume II, Section C; the results of the trial run, presented in various formats, are shown in Volume II, Section D.

A. State Performance Indices

1. GOAL ATTAINMENT: Changes in air quality and emissions during the period in relation to the air quality and emissions problems at the beginning of the period
    - 1.1. TSP Goal Attainment
    - 1.2. SO_2 Goal Attainment
    - 1.3. CO Goal Attainment
    - 1.4. O_x Goal Attainment
    - 1.5. NO_2 Goal Attainment

2. PROGRESS: Operational accomplishments during the period in relation to operational objectives or requirements at the beginning of the period
    - 2.1. Meeting MBO Commitments
    - 2.2. Source Compliance
    - 2.3. Surveillance and Enforcement Actions
    - 2.4. Monitoring and Reporting Air Quality and Emissions

3. ACHIEVEMENT: Cumulative operational accomplishments at the end of the period in relation to long-term operational objectives
    - 3.1. Source Compliance
    - 3.2. Monitoring and Reporting Air Quality and Emissions
    - 3.3. Completing Plans and Revisions

B. State Need Indices

4. PROBLEM: Need at the end of the period in relation to air quality and emissions goals
    - 4.1. Ambient Air Quality
    - 4.2. Emissions and Emission Sources
    - 4.3. Emission Reduction Needed

5. OPERATIONAL REQUIREMENTS: Need at the end of the period in relation to long-term operational objectives
    - 5.1. Source Compliance and Enforcement
    - 5.2. Monitoring and Reporting Air Quality and Emissions
    - 5.3. Completing Plans and Revisions

Figure I-7. Final Categorization Scheme (#7)

APPENDIX I-A

Personal Contacts

Meetings were held with the following persons in order to obtain information about data sources with which they were familiar, and/or input into and review of the evaluation system and component indicators.

EPA-Washington

Grants Administration:	Mr. Joe Rausher
Water Programs Operations:	Mr. Ed Richards
Office of Planning and Evaluation:	Mr. James R. Janis Mr. Frank Blair Mr. Barry Korb
Resource Management, Program Reporting Division:	Mr. Dario Monti
Stationary Source Enforcement Division:	Mr. Robert Duprey Mr. Jack Siegel Mr. Michael Merrick
Land Use Planning:	Dr. David Morrell
Intergovernmental Affairs:	Mr. Marvin B. Fast

EPA-RTP/Durham (Air Programs)

National Air Data Branch:	Dr. James R. Hammerle Mr. Gerald J. Nehls Mr. James H. Southerland
Monitoring and Data Analysis Division:	Mr. Thomas B. McMullen Mr. Alan J. Hoffman Mr. Jon R. Clark Mr. William M. Cox Mr. William Hunter
Control Programs Development Division:	Mr. Norman G. Edmisten Mr. David R. Dunbar Mr. Walter H. Stephenson Mr. Joseph J. Sableski Mr. John I. Eagles

APPENDIX I-A (Continued)

Data Services Division:	Ms. Maureen M. Johnson
Meteorology Division:	Mr. Gerald A. DeMarrais
Stationary Source Enforcement Division:	Mr. Kirk E. Foster
Air Pollution Training Institute:	Mr. Charles D. Pratt

EPA Regional Offices

Region III:	Mr. Henry Brubaker
Region IV:	
Planning and Operations:	Mr. Dwight Brown
Air Enforcement:	Mr. James Wilburn
Air Programs:	Mr. Thomas A. Gibbs Mr. Gregory Glahn Mr. Thomas Strickland Mr. Bryan Beal Mr. Mike DeBusschere Mr. Winston Smith
Region V:	
AHMD Division:	Mr. Thomas Mateer Mr. Roger Gorski Mr. J. Clesceri Mr. Ron Van Mersbergen
S & A Division:	Mr. Charles Miller Mr. Eugene Moran
Central Regional Laboratory:	Mr. John Logsoon
Enforcement Division:	Ms. Carol Foglesong
Region VIII:	Mr. Leo Stander
Region IX:	Mr. Wayne Blackard

APPENDIX I-B

Comprehensive List of Information Sources For Use as Input to SIP Objective Evaluation System

	Information Bit	Estimated Time Delay	Comments
Output Units			
1a.	Number of identified point sources determined to be in final compliance with emission requirements (by State)	3-6 months	
1b.	Number of identified point sources of unknown compliance status with final emission requirements (by State)	3-6 months	
1c.	Number of identified point sources out of compliance with final emission requirements which are not on schedule (by State)	3-6 months	
1d.	Number of identified point sources determined to be in compliance with scheduled increments (by State)	3-6 months	From: Management by Objectives FY 75 Operating Guidance
1e.	Number of point sources determined to be overdue in meeting increments of progress in schedules (by State)	3-6 months	
1f.	Number of point sources of unknown status regarding compliance with scheduled increments (by State)	3-6 months	
1g.	Number of field surveillance actions taken to determine source compliance status by:		
	(1) each State	3-6 months	
	(2) EPA in each State	3-6 months	
1h.	Number of enforcement actions undertaken by:		Type of action is important here
	(1) each State	3-6 months	
	(2) EPA in each State	3-6 months	
2a.	Number of revisions to regulatory portion of SIP (by State)	6-9 months	
2b.	Number of TCP and TCP revisions (by State)	6-9 months	
2c.	States with indirect source control plans	6-9 months	
2d.	States with all AQMA Plans completed	12-15 months	
3a.	States which have been delegated enforcement of NESHAPS	3-6 months	
3b.	States which have been delegated enforcement of NSPS	3-6 months	
4a.	Number of field tests to be conducted (fuel additives)	3-6 months	
5a.	Number of increments of progress that must be met to ensure compliance with all TCP's	3-6 months	

Information Bit	Estimated Time Delay	Comments
Output Units (Continued)		
5b. Number of parking facility construction permit applications to be reviewed (by State)	3-6 months	
6a. States with complete required network for criteria pollutants	3-6 months	
6b. States and local Quality Assurance Programs established	6-9 months	
7a. Percent of sources subject to NESHAPS (including spraying and demolition operations) which are in compliance with schedules of emission standards	3-6 months	
8a. Percent of sources subject to NSPS determined to be in compliance in each Region (by State)	3-6 months	

Comprehensive List of Information Sources
For Use as Input to
SIP Objective Evaluation System

Information Bit	Estimated Time Delay	Comments
Activity Indicators		
1a. Number of formal inquiries sent to all sources to determine compliance status by:		
(1) each State	3-6 months	
(2) EPA in each State (Sec. 114 letters)	3-6 months	
1b. Number of source tests conducted or observed to determine compliance status by:		
(1) EPA	3-6 months	
(2) all States in the Region	3-6 months	
1c. Number of notices of violation issued by:		From:
(1) each State	3-6 months	Management by Objectives FY 75 Operating Guidance
(2) EPA in each State	3-6 months	
1d. Number of abatement orders issued by:		
(1) each State	3-6 months	
(2) EPA in each State	3-6 months	
1e. Number of civil/criminal proceedings initiated by:		
(1) each State	3-6 months	
(2) EPA in each State	3-6 months	
4a. Number of laboratory tests performed	3-6 months	Unleaded gas program
4b. Number of stop-sale orders	3-6 months	
4c. Number of fines assessed	3-6 months	
Manpower Model		
1. Manpower required for monitoring activities	none	Based on parameters such as emission sources, monitoring equipment, population, etc.
2. Manpower required for source control activities		
3. Manpower required for overhead		

Information Bit	Estimated Time Delay	Comments
NADB		
1. SAROAD status score	3-6 months	Can be obtained for any period (e.g., over previous four quarters)
2. Number of sites with valid year of data	3-6 months	
3. Quality assurance grade	3-12 months	Not fully completed
4. Number and types of data items missing from NEDS form	none	
5. Number of sources discovered in verification file which are not in the original inventory	none	
6. Number of new sources sent into NEDS	none	
7. Percentage of miscalculated emission rates	none	Questionable availability
PRMS		
1. Potential deficiencies (projected values exceed actual by more than a pre-specified amount)		
2. Percent reduction in emissions necessary to achieve primary and secondary standards	6-12 months	According to proportional model
3. Correction factor needed to bring projection to standard at final compliance date.	6-12 months	
4. Number of observations (%) (a) > projected (b) > primary standard (c) > secondary standard	6-12 months	
5.. Total number of observations	6-12 months	

Information Bit	Estimated Time Delay	Comments
CDS		
1. See Output 1 of Guidance Package	3-6 months	
2. Percentage of total sources at each increment of progress which are on time, late, overdue, or in the future		In the early stages of implementation. Not all sources are included.
3. Number of sources on CDS		
4. Percentage of sources on CDS		
5. Visible emissions observations		
Air Pollution Training Institute		
1. Number of people trained from state/local agency per year	none	In the planning stages of automation
2. Number of student-days of training		
3. Number of personnel trained vs. size of agency		
4. Number of personnel trained vs. years of experience		
5. Many other types of training information will be available on completion of system automation		

Information Bit	Estimated Time Delay	Comments
Trends Report		
1. Minimum number of stations required in state (by pollutant)	6-12 months	Need definition of "required"
2. Number of stations reporting in state (by pollutant)	6-12 months	Need definition of "reporting"
3. Number of stations required and not reporting in state (by pollutant)	6-12 months	Based on stations in each state
4. Number of ACQR's in state reporting ≤ 1/2 M.R., 1/2 to M.R., and ≥ M.R.	6-12 months	
5. Same information as above for each AQCR	6-12 months	
6. Number of stations exceeding standards in each AQCR (by pollutant)	6-12 months	
National Air Monitoring Program - A.Q. and Emissions Trends Annual Report		
1. Number of monitoring stations required, proposed, and existing in each AQCR (by pollutant)	6-12 months	
2. Trends in A.Q. at NASN Station (by pollutant)	6-12 months	Down, up, or no change

Information Bit	Estimated Time Delay	Comments
Semiannual SIP Progress Report		
1. State and local support broken down by	3-6 months	
(a) TCP development		
(b) SIP revision		
(c) SIP secondary standards development		
(d) NEDS and air quality data reporting		
(e) Industrial source 10-year maintenance		
(f) Demonstration grant		
(g) Smelter study		
2. Status of SIP's	1-3 months	State or EPA promulgation, proposed, or deficient
(a) Public availability of data		
(b) Require source record-keeping and reporting		
(c) Review of new sources and modifications		
(d) Compliance schedules		
(e) TCP's		
(f) Emission limitations		
SO_2		
TSP		
HC		
NO_2		
(g) Air quality surveillance		
(h) Periodic testing and inspection		
(i) Emergency episode plan		
(j) Resources		
(k) Intergovernmental cooperation		
3. TCP acceptability (20 subprograms)	1-3 months	State or EPA promulgation

Other Possible Sources of Information Bits

1. F. W. Dodge Co. Reports--an automated system which provides data on new construction to compare with NEDS file and information on new sources for NSPS.
2. Census information--data on population, population density, housing, etc., to help in normalization of information bits and permit state versus state comparisons.
3. Dun and Bradstreet--check on NEDS file. Includes information on SIC, size, and operations involved within a facility.
4. R. L. Polk files--to obtain information on number of vehicles registered within a state or other geographical area.
5. Federal Power Commission Form 67 tapes--data on steam-electric generating plants above a certain capacity reported annually to FPC; tapes and summary file available at EPA.

APPENDIX I-C

STATE OBJECTIVE EVALUATION SYSTEM QUESTIONNAIRE

PART I.

Please weight the indicators within each of the following categories according to (1) their validity as measures of State performance or need, and (2) if valid, their importance relative to the other indicators in the category.

The following weighting system should be used:

0 = indicator is invalid or useless; should not be given any weight
1 = unimportant indicator; should be given little weight
2 = fair indicator
3 = good indicator
4 = very important indicator; should be weighted heavily

These weights should reflect differences in magnitude; two indicators or categories may have the same weight if they are of equal validity and importance.

No criteria for weighting the indicators are given. Your overall judgment based on whatever criteria you consider relevant and important is desired. Space is provided for any comments you may have regarding the indicators or any additional indicators you consider relevant.

A. Weight the following items according to their importance as indirect indicators of the magnitude of a State's air quality problem:

Weight (0-4)

1. Total population ____________
2. Urban population (no. of persons in urban areas) ____________
3. Total land area (square miles) ____________
4. Urbanized land area (square miles) ____________
5. No. of AQMAs ____________
6. Population in AQMAs (no. of persons) ____________
7. Total fuel consumption ____________
8. Projected population/economic growth ____________
9. Average no. of days of air stagnation ____________
10. Average no. of heating degree-days ____________
11. Other (specify) ________________________ ____________
12. ________________________________ ____________

Comments: ____

____

____

B. Weight the following items according to their importance as direct indicators of the magnitude of a State's air quality problem:

Weight (0-4)

1. Total emission reduction needed (current emissions minus 1975 allowable emissions) ________
2. Stationary point source emission reduction needed (current minus 1975 allowable emissions) ________
3. Deviation of measured TSP annual means from the TSP annual standards ________
4. Deviation of measured TSP concentrations from the TSP 24-hour standard ________
5. No. of sites with potential deficiencies flagged by PRMS ________
6. Other (specify) ______________________ ________
7. ______________________ ________

Comments: ____

____

____

C. Weight the relative importance of direct and indirect indicators of the magnitude of a State's air quality problem (as listed in A. and B. above):

Weight (0-4)

1. Direct indicators ________
2. Indirect indicators ________

Comments: ____

____

____

D. Weight the following MBO Outputs according to their importance as indicators of State performance:

Weight (0-4)

1. Output # 1 - Source compliance and enforcement ________
2. Output #2 - SIP revisions & completions ________
3. Output #3 - NESHAPS and NSPS delegation ________
4. Output #5 - Transportation control plans ________
5. Output #6 - Completion of air monitoring networks ________
6. Outputs # 7 & 8 - NESHAPS and NSPS compliance ________

Comments: ____

____

____

E. Weight the following items according to their importance as indicators of the quality of a State's monitoring & reporting of air quality & emissions:

Weight (0-4)

1. No. of reporting stations in relation to minimum required no. of stations ____________
2. No. of reporting stations in relation to no. of stations proposed in SIP ____________
3. Percent of AQCRs with the minimum required or proposed no. of stations ____________
4. Average percent of minimum required or proposed no. of stations reporting in all the AQCRs in any one State ____________
5. Use of reference or equivalent pollutant-methods ____________
6. Validity and sufficiency of data submitted to SAROAD ____________
7. Completeness of list of sources on NEDS relative to regional goals ____________
8. Completeness of data submitted to NEDS ____________
9. Completeness of list of sources on CDS relative to regional goals ____________
10. Quality Assurance status (existence of QA program, QA grade) ____________
11. Other (specify) ________________________ ____________
12. ________________________________ ____________

Comments: ____

____

____

PART II.

Please weight the indicators within each of the following categories according to their importance, relative to the other indicators in the category, in terms of (1) regional priorities, and (2) the amount of resources needed to achieve them.

As weights, use any positive number(whole number or fraction)that expresses the magnitude of difference in importance or resources required. These weights are not ordinal rankings; two indicators may have the same weight if they are of equal importance.

Example A. Weight the following pollutants:

A complete (minimum required no. of stations) SO_2 monitoring network is:

1/2 times as important as a complete TSP monitoring network
2 times as important as a complete CO monitoring network
4 times as important as a complete O_x monitoring network
10 times as important as a complete NO_x monitoring network

A. Weight the following pollutants:

A complete(minimum required no. of stations) SO_2 monitoring network is:

____ times as important as a complete TSP monitoring network
____ times as important as a complete CO monitoring network
____ times as important as a complete O_x monitoring network
____ times as important as a complete No_x monitoring network

Comments: ____

____

____

B. Weight the following field surveillance and enforcement actions:

1 source (stack) test is equivalent to:

____ process (plant) inspections(s)
____ opacity observation(s)
____ notice(s) of violation
____ abatement order(s)
____ civil/criminal proceeding(s)
____ other(specify) ______________________________
____ ____

Comments: ____

____

____

C. Weight the following types of source compliance status:

1 source whose compliance status is known is equivalent to:

____ source(s) in final compliance with emission requirements
____ source(s) on compliance schedule
____ source(s) in compliance with scheduled increments of progress
____ other(specify) ____________________

Comments:____________________

D. Weight the following components of a SAROAD reporting score:

1 station-quarter of valid & timely data is equivalent to:

____ station-quarter(s) of valid and late data
____ station-quarter(s) of invalid and timely data
____ station-quarter(s) of invalid and late data

Comments:____________________

E. Weight the following SIP plans and revisions:

1 regulatory portion of the SIP completed is equivalent to:

____ TCP or TCP revision(s) completed
____ indirect source plan(s) completed
____ AQMA analysis & plan(s) completed
____ NESHAPS procedures completed
____ NSPS procedures completed
____ other (specify) ____________________

Comments:____________________

VOLUME II - MANUAL FOR THE SYSTEM

Introduction

The system described herein provides a method for organizing and presenting information on the status of selected aspects of the state air pollution control situation in the U.S., using currently available data from existing reporting systems. It consists of a framework of measures of selected aspects of state air programs, and a methodology for computing and presenting values and comparative scores for these measures.

The purpose of the system is to consolidate and organize into a coherent framework, data routinely reported to EPA headquarters as well as data drawn from standard national data sources. The system requires no reporting by states to EPA beyond what is already required nor has it been a factor in the current reporting requirements.

The system meets the four major constraints imposed on it at its conception. These constraints were:

(1) to use data currently available or projected to be available in the near future, drawn from existing data banks and reporting systems,

(2) to be applicable to all states and territories,

(3) to be of immediate use to EPA once it was developed and tested, and

(4) to be capable of being implemented on a regular basis using updated data.

Possible uses of the system as well as its limitations are discussed in Section E. The system is not a comprehensive evaluation system because of the constraint against requiring new data. It is a way of organizing data into a coherent framework within which state air pollution control status can be examined.

It should also be noted that the state (or territory) is the unit of analysis of interest in this system, requiring generalizations from component AQCRs. While there is some doubt that one can generalize about the ambient air quality of an entire state, the state is considered the most meaningful unit in relation to control activities and need, because the state has ultimate responsibility for air pollution control under the Clean Air Act and federal regulations.

The following sections discuss:

-- the framework of measures, including descriptions of each;

-- the methodology for computing values and scores for the indicators, including the sources of data used;

-- the trial run of the system conducted to verify the availability of data and to test the validity of indicators;

-- alternative formats for presenting results, and

-- issues and problems in implementing the system, including possible uses and limitations and the feasibility of automating the system.

Readers interested only in the general outlines of the system can limit their reading to sections A, D, and E. Sections B and C are written for those who are interested in actually implementing the system. In addition, reference is made to the Workbook (Appendix II-E). The Workbook includes worksheets and tables needed to compute values and scores, and output formats for presenting values and scores.

A. Description of Measures

Measures are organized into a four-level structure (see Figure II-1). At the lowest level of aggregation (level 4), sub-indicators are composed of combinations of individual data items drawn from existing data systems. In some cases, there are no sub-indicators and the indicator (level 3) would then be composed of data items.

Appendix II-A presents a list and summary description of all sources of data used in the system.

In constructing indicators or sub-indicators from data items, data is used in as many combinations as possible that reveal some aspect of control agency status or activities for which a measure might be valid and useful. Measures are normalized, i.e., related to a norm or standard, so that one state could be compared meaningful to another. The basic premise is that a state should be evaluated in terms of national goals or objectives or in terms of its own objectives (not inconsistent with national goals). For example, an air quality improvement indicator measures not merely absolute improvements (in $\mu g/m^3$, etc.), but also improvements relative to achievement of the national ambient air quality standards.

One or more sub-indicators comprise an indicator (level 3). At the next level of aggregation, a sub-index (level 2) is composed of one or more indicators. Finally at the highest level of aggregation, an index (level 1) is composed of one or more sub-indices.

An index represents an aspect of state status in relation to overall goals or operational objectives, within a specified time frame and encompassing the range of program activities of an air pollution control agency, for which an overall score was thought to be meaningful.

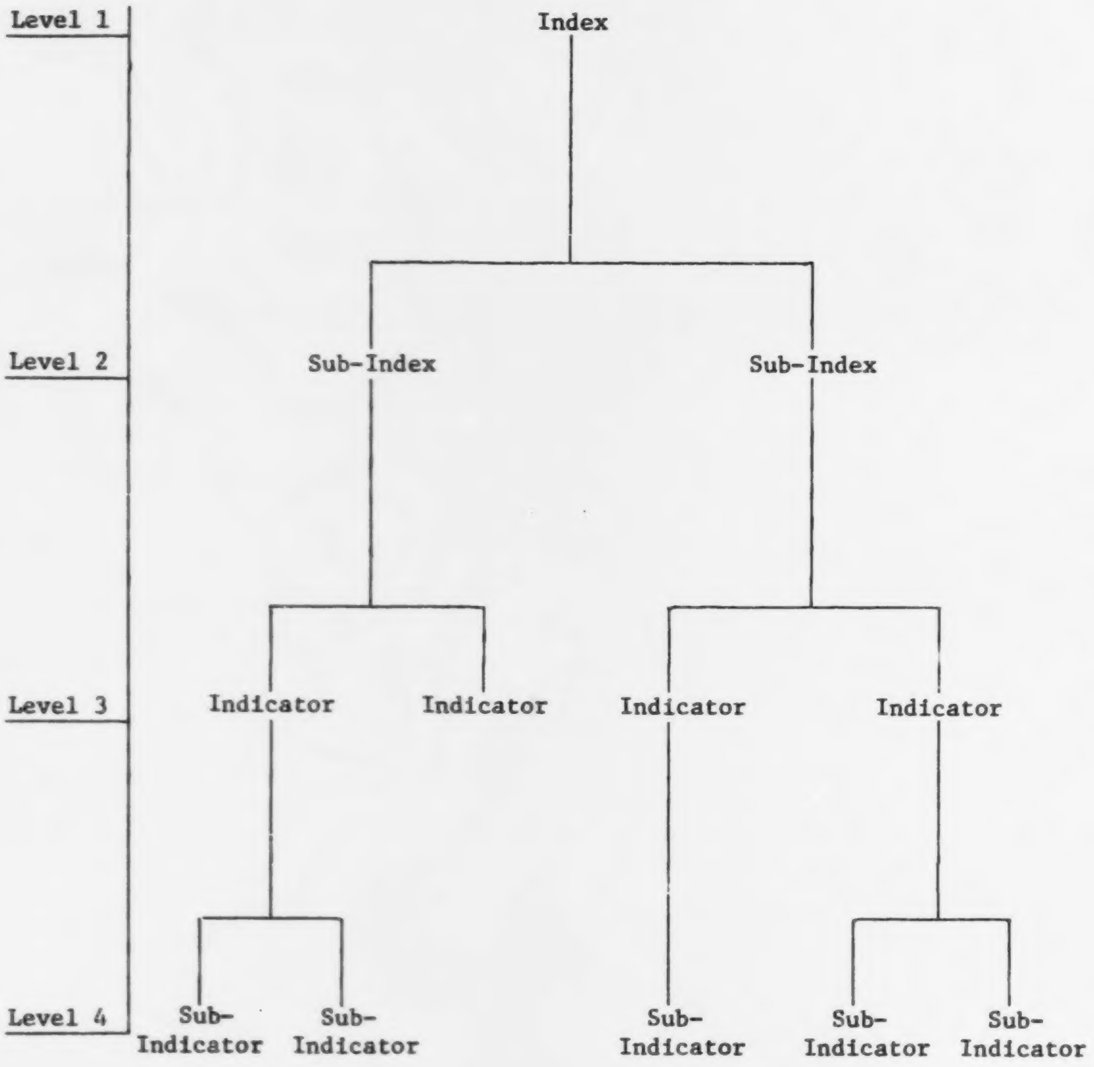

Level 1
Level 2
Level 3
Level 4
Index
Sub-Index
Sub-Index
Indicator
Indicator
Indicator
Indicator
Sub-Indicator
Sub-Indicator
Sub-Indicator
Sub-Indicator
Sub-Indicator

Figure II-1. Index Structure

There are five indices that make up the system. Three indices measure state performances in relation to goals and objectives. One of these three indices (Goal Attainment) measures performance in relation to long-term goals of AQ improvement and emissions reductions. The other two (Progress and Achievement) measure performance in relation to more immediate operational objectives that are necessary to accomplishing goals. These objectives are meeting (MBO) commitments, ensuring source compliance, carrying out surveillance and enforcement actions, monitoring and reporting to EPA air quality and emissions, and completing SIP plans and plan revisions. Progress measures performance in a given period of evaluation, such as a calendar year, while Achievement measures cumulative performance up to a given point in time (usually the end of the period of evaluation).

Two indices measure state need. Problem measures need in relation to air quality and emission goals, while Operational Requirements measures need in relation to operational objectives.

The five indices are broken down into 18 sub-indices. An outline and brief description of the indices and sub-indices are presented in Figure II-2.

Each of the indices, sub-indices, indicators, and sub-indicators as outlined in Figure II-2 is described below. A flowchart is presented for each index showing the four-level structure of the index. The "present period of evaluation" refers to the period of time for which the data used in the computation of indicators are relevant (such as calendar year 1973); "previous period of evaluation" means the period of time of equal length that immediately preceded the present period (if calendar year 1973 is the present period, calendar year 1972 is the previous period).

A. State Performance Indices

1. GOAL ATTAINMENT: Changes in air quality and emissions during the period in relation to the air quality and emissions problems at the beginning of the period

    1.1. TSP Goal Attainment
    1.2. SO_2 Goal Attainment
    1.3. CO Goal Attainment
    1.4. O_x Goal Attainment
    1.5. NO_2 Goal Attainment

2. PROGRESS: Operational accomplishments during the period in relation to operational objectives or requirements at the beginning of the period

    2.1. Meeting MBO Commitments
    2.2. Source Compliance
    2.3. Surveillance and Enforcement Actions
    2.4. Monitoring and Reporting Air Quality and Emissions

3. ACHIEVEMENT: Cumulative operational accomplishments at the end of the period in relation to long-term operational objectives

    3.1. Source Compliance
    3.2. Monitoring and Reporting Air Quality and Emissions
    3.3. Completing Plans and Revisions

B. State Need Indices

4. PROBLEM: Need at the end of the period in relation to air quality and emissions goals

    4.1. Ambient Air Quality
    4.2. Emissions and Emission Sources
    4.3. Emission Reduction Needed

5. OPERATIONAL REQUIREMENTS: Need at the end of the period in relation to long-term operational objectives

    5.1. Source Compliance and Enforcement
    5.2. Monitoring and Reporting Air Quality and Emissions
    5.3. Completing Plans and Revisions

Figure II-2. Outline of Indices

1. Performance Indices: Measure state efforts and accomplishments in relation to national or state goals and objectives.

   a. Index 1. GOAL ATTAINMENT (see flowchart, Figure II-3, p. II-8)

   Index 1 measures changes in air quality and emissions in a state from the previous period of evaluation to the present period, in relation to the air quality and emissions problems during the previous period. Each sub-index measures goal attainment for a particular pollutant:

   1.1. TSP Goal Attainment
   1.2. SO_2 Goal Attainment
   1.3. CO Goal Attainment
   1.4. O_x Goal Attainment
   1.5. NO_2 Goal Attainment.

   The goal attainment sub-index for each pollutant is composed of 3 indicators: (1) ambient air quality improvement, (2) emission reduction, and (3) PRMS flags.

   (1) The ambient air quality improvement indicator measures changes in air quality in relation to long-term and short-term primary standards, as applicable, for each pollutant (i.e., TSP annual and 24-hour primary standards, SO_2 annual and 24-hour primary standards, CO 8-hour and 1-hour primary standards, O_x 1-hour primary standard, and NO_2 annual primary standard). Using a set of monitoring stations that reported data to SAROAD in both the present and previous periods, (a) changes in the sum of percentage deviations above standards (air quality worse than standards), for states that exceeded the standard at any station in both years, or (b) changes in the sum of all observations, for states that did not exceed the standard in either year, are calculated.

FLOWCHART FOR INDEX 1. GOAL ATTAINMENT

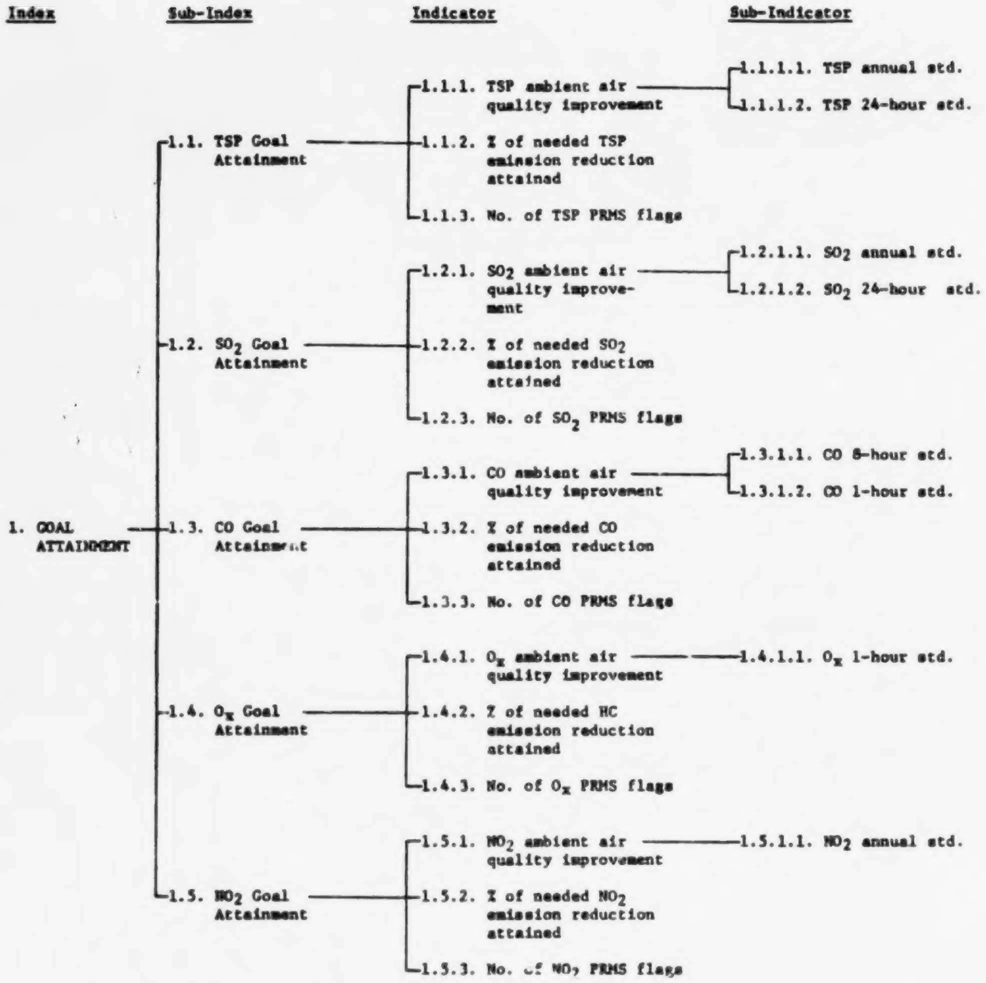

Index
Sub-Index
Indicator
Sub-Indicator
1. GOAL ATTAINMENT
1.1. TSP Goal Attainment
1.1.1. TSP ambient air quality improvement
1.1.1.1. TSP annual std.
1.1.1.2. TSP 24-hour std.
1.1.2. % of needed TSP emission reduction attained
1.1.3. No. of TSP PRMS flags
1.2. SO2 Goal Attainment
1.2.1. SO2 ambient air quality improvement
1.2.1.1. SO2 annual std.
1.2.1.2. SO2 24-hour std.
1.2.2. % of needed SO2 emission reduction attained
1.2.3. No. of SO2 PRMS flags
1.3. CO Goal Attainment
1.3.1. CO ambient air quality improvement
1.3.1.1. CO 8-hour std.
1.3.1.2. CO 1-hour std.
1.3.2. % of needed CO emission reduction attained
1.3.3. No. of CO PRMS flags
1.4. Ox Goal Attainment
1.4.1. Ox ambient air quality improvement
1.4.1.1. Ox 1-hour std.
1.4.2. % of needed HC emission reduction attained
1.4.3. No. of Ox PRMS flags
1.5. NO2 Goal Attainment
1.5.1. NO2 ambient air quality improvement
1.5.1.1. NO2 annual std.
1.5.2. % of needed NO2 emission reduction attained
1.5.3. No. of NO2 PRMS flags

Fig. II-3

(2) The emission reduction indicator measures the percentage of the needed emission reduction for each pollutant (emission goal minus actual emissions) in the previous period, that was actually attained from the previous to the present period. Total emissions for each pollutant from all point and area sources in a state reported to NEDS are used.

(3) The PRMS flags indicator is equal to the number of monitoring sites flagged as having "potential deficiencies" by the Plan Revision Management System. This represents the number of sites in a state that appear not to be meeting schedules for ambient air quality improvement. The higher the number of flags, the lower the extent of goal attainment. However, the number of flags depends on the number of sites with sufficient data for analysis. PRMS requires readings for four consecutive quarters at each site analyzed. Some states may have many sites that are reporting enough valid data to enable a PRMS analysis. Other states may have relatively fewer sites. For this reason, along with the number of sites flagged, the number of stations that were analyzed by PRMS is also presented in order to put the number of flags in perspective.*

---

* A correction factor similar to that used in the AQDI (see p. II-30) was considered, but rejected. It was thought unworkable in this case because the number to be corrected is in most cases a small integer. Indeed the number is often 0 and such a correction factor, no matter how large, would not increase 0 to a larger number.

b. Index 2. PROGRESS (see flowchart, Figure II-4, on p. II-11)

Index 2 measures operational accomplishments during the present period in relation to operational objectives at the beginning of the period. Each sub-index measures accomplishments in relation to a particular objective:

2.1. Meeting MBO Commitments
2.2. Source Compliance
2.3. Surveillance and Enforcement Actions
2.4. Monitoring and Reporting Air Quality and Emissions

(1) Sub-Index 2.1. Meeting MBO Commitments represents the percentage of output commitments that was actually met by a state as reported through the EPA Formal Reporting System and summarized in the *State Activity Report*.

At the beginning of a fiscal year states are required, as a result of negotiations with EPA Regional Offices, to estimate the tasks that will be performed during the upcoming year for each output specified by EPA. During the ensuing year states periodically report their actual accomplishments for each output.

Because the only output category that Regional Offices are required to report broken down by state is Category #1, source compliance outputs, this was the only output category that could be used to measure performance for this sub-index. Thus there is only 1 indicator under sub-index 2.1. (Any changes in output reporting requirements, of course, need to be reflected in the make-up of this sub-index. Significant changes in output format will make it difficult to compare performance from one period to the next.) Indicator 2.1.1. measures the degree of accomplishment of outputs in output category 1, and is composed of 8 sub-indicators, each measuring the percentage of commitments that were actually accomplished for each output or combination of outputs.

FLOWCHART FOR INDEX 2. PROGRESS

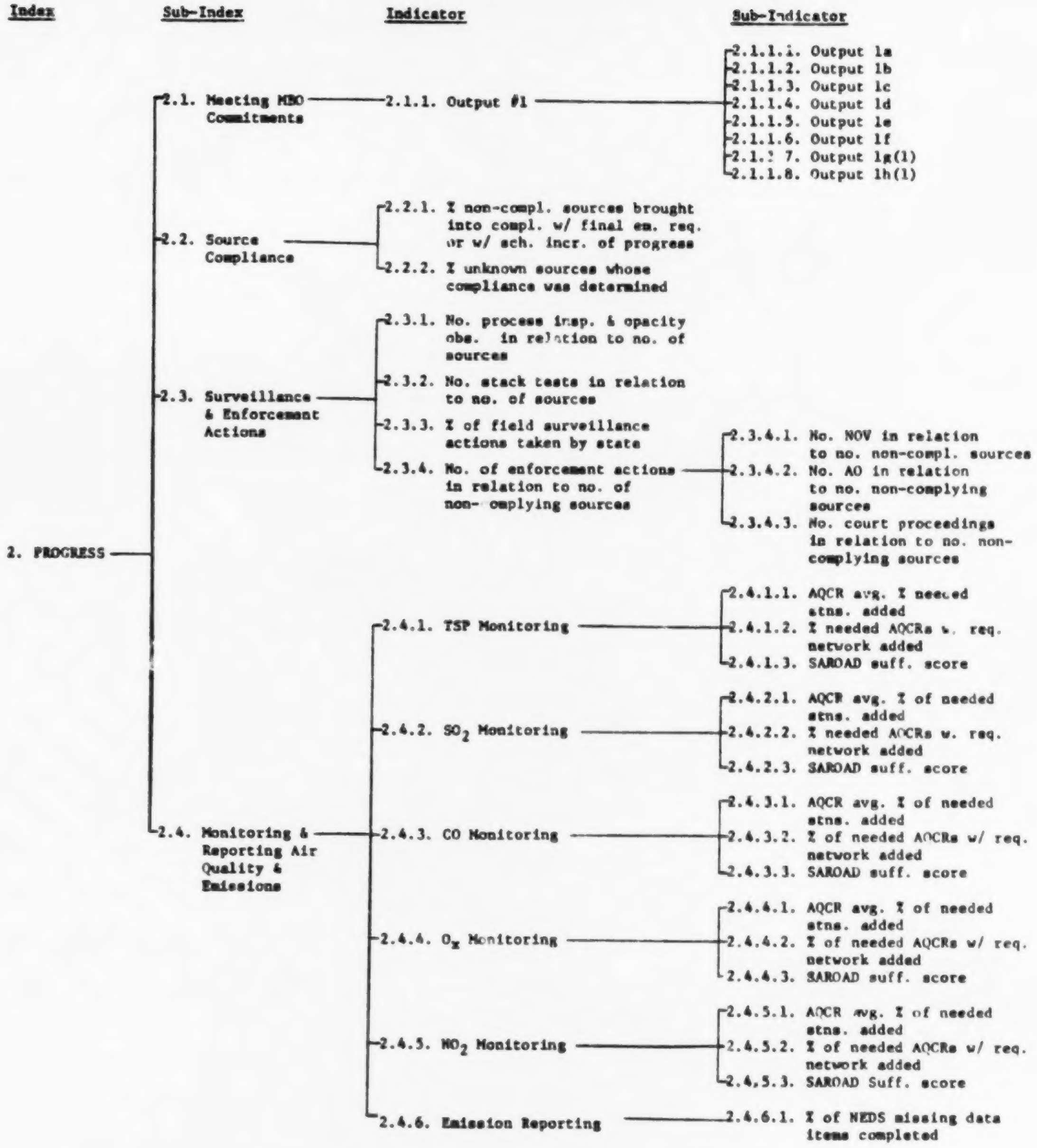

Index
Sub-Index
Indicator
Sub-Indicator
2. PROGRESS
2.1. Meeting MBO Commitments
2.1.1. Output #1
2.1.1.1. Output 1a
2.1.1.2. Output 1b
2.1.1.3. Output 1c
2.1.1.4. Output 1d
2.1.1.5. Output 1e
2.1.1.6. Output 1f
2.1.1.7. Output 1g(1)
2.1.1.8. Output 1h(1)
2.2. Source Compliance
2.2.1. % non-compl. sources brought into compl. w/ final em. req. or w/ sch. incr. of progress
2.2.2. % unknown sources whose compliance was determined
2.3. Surveillance & Enforcement Actions
2.3.1. No. process insp. & opacity obs. in relation to no. of sources
2.3.2. No. stack tests in relation to no. of sources
2.3.3. % of field surveillance actions taken by state
2.3.4. No. of enforcement actions in relation to no. of non-complying sources
2.3.4.1. No. NOV in relation to no. non-compl. sources
2.3.4.2. No. AO in relation to no. non-complying sources
2.3.4.3. No. court proceedings in relation to no. non-complying sources
2.4. Monitoring & Reporting Air Quality & Emissions
2.4.1. TSP Monitoring
2.4.1.1. AQCR avg. % needed stns. added
2.4.1.2. % needed AQCRs w. req. network added
2.4.1.3. SAROAD suff. score
2.4.2. SO2 Monitoring
2.4.2.1. AQCR avg. % of needed stns. added
2.4.2.2. % needed AQCRs w. req. network added
2.4.2.3. SAROAD suff. score
2.4.3. CO Monitoring
2.4.3.1. AQCR avg. % of needed stns. added
2.4.3.2. % of needed AQCRs w/ req. network added
2.4.3.3. SAROAD suff. score
2.4.4. Ox Monitoring
2.4.4.1. AQCR avg. % of needed stns. added
2.4.4.2. % of needed AQCRs w/ req. network added
2.4.4.3. SAROAD suff. score
2.4.5. NO2 Monitoring
2.4.5.1. AQCR avg. % of needed stns. added
2.4.5.2. % of needed AQCRs w/ req. network added
2.4.5.3. SAROAD Suff. score
2.4.6. Emission Reporting
2.4.6.1. % of NEDS missing data items completed

Fig. II-4

Sub-indicators 2.1.1.1., 2.1.1.2. and 2.1.1.3. measure the percentages of commitments for the number of sources in final compliance with emission requirements (1a), the number of sources whose final compliance status is unknown (1b), and the number of non-complying sources not on compliance schedules (1c), respectively, that were actually accomplished, as reported by the states.

Sub-indicator 2.1.1.4. measures the percentage of the committed number of sources in final compliance or in compliance with scheduled increments of progress (outputs 1a + 1d) that was accomplished. Because a source on a compliance schedule and in compliance with scheduled increments of progress, that attained final compliance with emission requirements, is no longer counted in output 1d, it would not be valid to interpret a decrease in output 1d as poor performance on the part of a state. Many states' commitments for 1d increase for part of the year as sources are put on compliance schedules and brought into compliance with increments of progress, and then decrease as sources achieve final compliance with emission requirements. In such cases, it is impossible to determine on the basis of the numbers alone whether a lower number of output 1d accomplishment is due to fewer sources brought into compliance with increments or more sources achieving final compliance. Therefore, outputs 1a (sources in final compliance) and 1d (sources in compliance with increments of progress) were combined to account for the movement of sources from 1d to 1a.

The same argument can be made for output 1e, sources overdue in meeting scheduled increments of progress. Many states' commitments for 1e increase for part of the year as more sources are put on compliance schedules and become overdue in meeting increments, and then decrease as sources are brought into compliance with increments and with final emission requirements. In such cases, a lower number of output 1e accomplishment may be due to fewer sources being put on compliance schedules or more sources kept in compliance with increments of progress. Therefore, sub-indicator 2.1.1.5. measures the percentage of outputs 1a + 1d + 1e + 1f, sources in final compliance or on compliance schedules, that was accomplished.

Sub-indicator 2.1.1.6. measures the percentage accomplishment of the committed number of sources on compliance schedules whose compliance status with regard to increments of progress was unknown (output 1f). Sub-indicator 2.1.1.7. measures the percentage accomplishment of state commitments for the number of state field surveillance actions (output 1g(1)), which includes process inspections, opacity observations, and stack tests. Sub-indicator 2.1.1.8. measures accomplishment of commitments for the number of state enforcement actions (output (1h(1)), including notices of violation, abatement orders, and court proceedings.

Because the MBO output numbers do not by themselves reveal the movement of sources from one status to another, it is hoped that the CDS, once it is fully operational in all regions, will be able to fill in the gaps and provide more detailed analysis of the accomplishment of MBO commitments.

(2) Sub-Index 2.2. Source Compliance measures the accomplishment of source compliance objectives during the present period. The

source of the data used is the EPA Formal Reporting System State Activity Report.

Indicator 2.2.1. represents the percentage of non-complying sources that was brought into compliance with final emission requirements or with scheduled increments of progress during the present period. Indicator 2.2.2. is the percentage of sources with unknown compliance status, both in regard to final compliance and compliance with scheduled increments, whose status was determined during the present period.

The same reservations expressed about the MBO outputs under sub-index 2.1. apply here. Thus indicator 2.2.1. combines outputs so as to avoid difficulties with movement of sources from one status to another. As in sub-index 2.1., CDS should be able to provide additional and more detailed information once it is fully operational in all regions.

(3) Sub-Index 2.3. Surveillance and Enforcement Actions is the sub-index that measures the number of field surveillance and enforcement actions taken during the period in relation to the number of sources requiring action. Almost all data is from the EPA Reporting System State Activity Report.

Indicator 2.3.1. looks at the number of process inspections and opacity observations conducted by the state in relation the total number of sources requiring field surveillance. Three alternatives for the number of sources in a state requiring field surveillance were considered: the number of sources in CDS, the number of sources in NEDS, and the number of manufacturing facilities listed by Dun & Bradstreet. The number of sources in CDS was not considered appropriate since these sources are usually the major sources requiring compliance monitoring (although this varies from region to region); it was felt that often many more sources than those on CDS should be the object of some kind of field surveillance. The completeness of the state NEDS inventories, it was agreed, varied considerably, and use of the number of sources on NEDS might penalize states that wanted to enter into NEDS as many sources as possible, as opposed to states that wished to concentrate only on major emitters. Therefore, the number of manufacturing facilities listed in the Dun & Bradstreet DMI (Dun Market Identifiers) file was chosen. While it is recognized that the number from the DMI file may be misleading in some cases (e.g., a facility may be listed for tax purposes as more than one plant), it is felt that the DMI file provides the number most consistent from state to state.

It is also recognized that the number of process inspections and opacity observations does not indicate the quality of the inspection or observation, and therefore may penalize the state that takes more time and does a better job for each. However, there exists no way of measuring the quality of the field surveillance action from data routinely reported to Headquarters. Results of this indicator, therefore, should be looked at with this caveat in mind.

The number of stack tests conducted by the state in relation to the total number of sources requiring field surveillance is measured by indicator 2.3.2. Stack tests were examined separately from other field surveillance actions because of the amount of time stack tests take. The same caveat concerning the quality of the action taken discussed above applies here.

Indicator 2.3.3. measures the percentage of field surveillance actions done by both the state and EPA, that was done by the state. This is meant to indicate whether the state is performing an adequate number of surveillance actions, or whether EPA has had to step in to significantly supplement state actions. However, this may penalize states that happen to be in a region where EPA, for reasons other than the adequacy of state surveillance, has undertaken a significant federal surveillance program.

Indicator 2.3.4. looks at the number of enforcement actions taken by a state and by EPA in that state, in relation to the number of non-complying sources. Because many states have arrangements with EPA concerning enforcement actions (i.e., a state may ask EPA to take a particular action because of limitations in state law or administrative regulations), all enforcement actions, whether state or federal, are counted. However, there may be cases when a regional office may not want to include EPA actions in their states, because the EPA actions do indicate failure on the states' part to take needed actions. Non-complying sources are sources that are not in final compliance with emissions requirements and that (a) are not on compliance schedules, or (b) are on compliance schedules but are not in compliance with increments of progress. The indicator is composed of 3 sub-indicators, each referring to a different type of enforcement action.

Sub-indicator 2.3.4.1. deals with the number of notices of violation issued by a state and EPA in relation to the number of non-complying sources. There are 2 factors that may affect the validity of this sub-indicator. First, some states do not have an exact equivalent to the EPA section 113 notice of violation. Thus the number of notices of violation issued that is reported to EPA may refer to a somewhat different action. Second, a separate notice of violation may, depending on state regulations and procedures, be issued for each pollutant emitted from each point within a source. Therefore, not only can the number of notices vary significantly from the number of sources, but in addition the degree of variance depends on the average number of points within a source in each state as well as the administrative regulations and procedures of that state.

These problems also affect, perhaps less drastically, sub-indicator 2.3.4.2., the number of abatement orders issued by a state and EPA in relation to the number of non-complying sources.

Finally, sub-indicator 2.3.4.3. looks at the number of civil or criminal court proceedings initiated by the state and EPA in relation to the number of non-complying sources. It is recognized that many, if not most, states try to avoid court proceedings, preferring to rely on administrative actions to ensure source compliance. Nevertheless it was decided that this sub-indicator still provides a valid measure by which states could be compared.

(4) Sub-Index 2.4. Monitoring and Reporting Air Quality and Emissions measures performance in relation to operational objectives of monitoring and reporting ambient air quality and emissions of the criteria pollutants. Five of the indicators relate to ambient air quality monitoring and reporting to SAROAD for the five criteria pollutants:

2.4.1. TSP Monitoring
2.4.2. SO_2 Monitoring
2.4.3. CO Monitoring
2.4.4. O_x Monitoring
2.4.5. NO_2 Monitoring

The last indicator relates to reporting emissions to NEDS:

2.4.6. Emissions Reporting.

Each of the ambient air quality (AAQ) monitoring indicators (2.4.1.-2.4.5.) is composed of 3 sub-indicators: (a) AQCR average percentage of needed monitoring stations added, (b) percentage of AQCRs needing stations that achieved complete monitoring networks, and (c) SAROAD sufficiency score.

(a) The AQCR average % of needed stations added is equal to the ratio of: the number of stations in an AQCR using an acceptable pollutant method to monitor a given pollutant and reporting sufficient data for at least 1 quarter per year to SAROAD added during the present period, to the number of such stations that needed to be added during the previous period to complete the federally required minimum network, averaged over all AQCRs in the state. In other words, this is the average percentage of the number of stations that needed to be added that were actually added during the present period. The minimum numbers of stations required by EPA are set forth in 40CFR51. Alternatively, the numbers of stations proposed in the State Implementation Plans may be used instead of the federal minimum.

For each AQCR the maximum percent of needed stations added is 100%; no credit is given for adding more than the minimum needed number of stations.

Thus the maximum value for each sub-indicator, which is the average % of all AQCRs in a state, is also 100%.

The reason for this limit is to avoid the situation where an AQCR that adds more stations than needed would balance out another AQCR that added fewer than the number needed.

If no stations were needed in any AQCR in the state in the previous period, no value is computed for this sub-indicator. The purpose of this sub-indicator is to measure how much of the distance from a completed network was covered in the AQCRs during the present period.

(b) The percentage of AQCRs needing stations that achieved complete federally required minimum networks is equal to the ratio of: the number of AQCRs in a state that attained the minimum required network during the present period (number of AQCRs in present period with complete network minus number in previous period), to the number of AQCRs that had less than the minimum required networks in the previous period. If all the AQCRs in the state had at least the minimum required network during the previous period, no value is computed for this sub-indicator. This sub-indicator together with the previous sub-indicator accounts for states that attempted to add some stations to each AQCR with incomplete networks as well as states that concentrated their new monitors in certain AQCRs.

(c) The SAROAD sufficiency score is the percentage of station-quarters reported to SAROAD during the present period that met SAROAD sufficiency criteria. While the other two sub-indicators measure network completion for each pollutant, this sub-indicator provides some measure of the sufficiency of the data submitted. Sufficiency, as used here by SAROAD, refers to the number of observations reported during a quarter and the distribution of observations throughout a quarter (minimum sufficiency for 24-hour integrating samples is 5 values per quarter distributed over at least 2 of the 3 months of the quarters with at least 2 samples in each of the 2 months if there is no sample in the third month, and for continuous instruments 75% of the possible hourly values for annual summaries).

Indicator 2.4.6. measures progress in completing emissions information reported to NEDS and has one sub-indicator. Sub-indicator 2.4.6.1. measures the number of missing necessary NEDS data items that were completed during the present period in relation to the number of necessary data items that were missing at the beginning of the period. A necessary NEDS data item is a data bit requested for every point, source, or plant in NEDS that is considered most important to meet the basic purposes of NEDS. The selection of the necessary data items for the trial run was made after consultation with various EPA personnel, and include all items on the point source form except: city, contact, plume height, compliance schedule year and month, compliance status update year, month and day, and ECAP.

c. Index 3. ACHIEVEMENT. (see flowchart, Figure II-5, on p. II-21)

Index 3 measures the cumulative operational accomplishments of a state at the end of the present period in relation to long-term

FLOWCHART FOR INDEX 3. ACHIEVEMENT

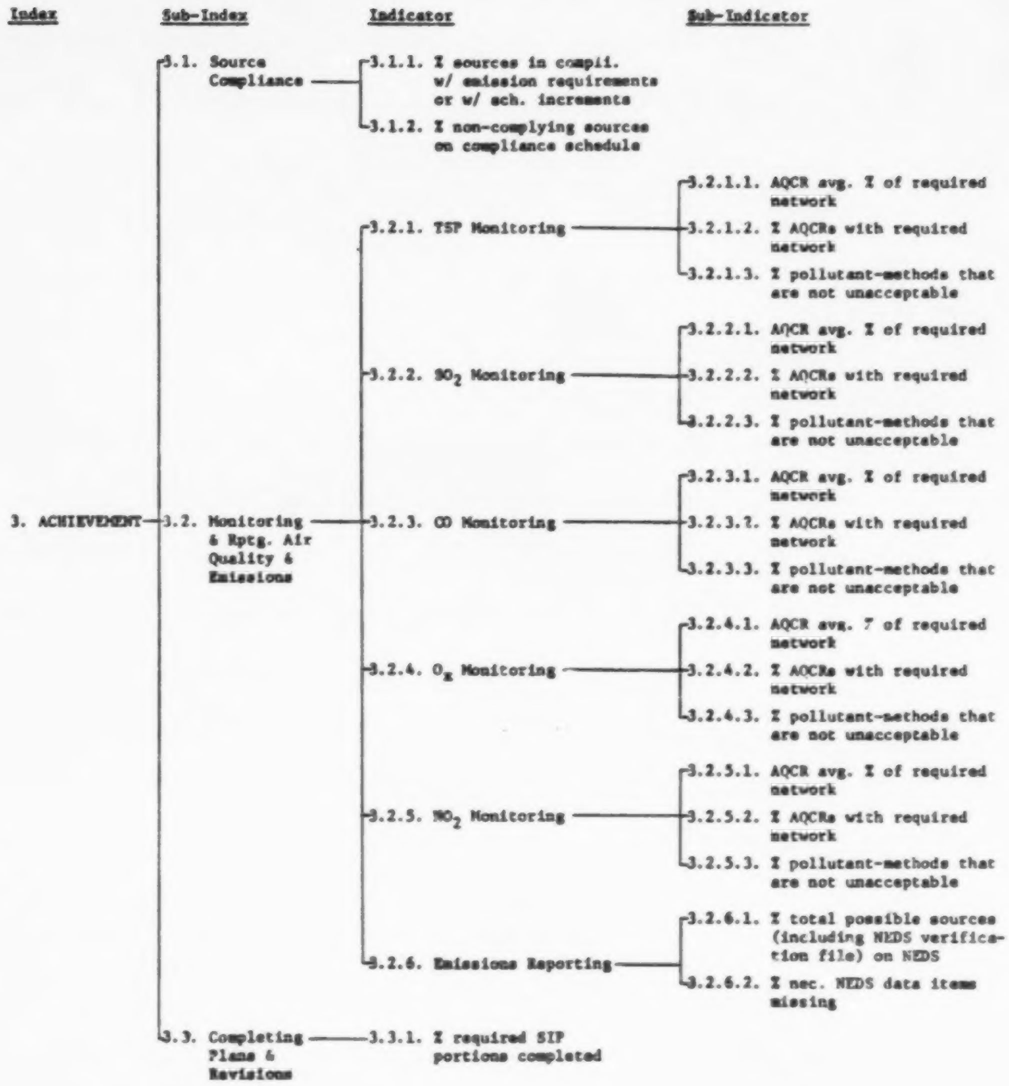

Index
Sub-Index
Indicator
Sub-Indicator
3. ACHIEVEMENT
3.1. Source Compliance
3.1.1. % sources in compli. w/ emission requirements or w/ sch. increments
3.1.2. % non-complying sources on compliance schedule
3.2. Monitoring & Rptg. Air Quality & Emissions
3.2.1. TSP Monitoring
3.2.1.1. AQCR avg. % of required network
3.2.1.2. % AQCRs with required network
3.2.1.3. % pollutant-methods that are not unacceptable
3.2.2. SO2 Monitoring
3.2.2.1. AQCR avg. % of required network
3.2.2.2. % AQCRs with required network
3.2.2.3. % pollutant-methods that are not unacceptable
3.2.3. CO Monitoring
3.2.3.1. AQCR avg. % of required network
3.2.3.2. % AQCRs with required network
3.2.3.3. % pollutant-methods that are not unacceptable
3.2.4. Ox Monitoring
3.2.4.1. AQCR avg. % of required network
3.2.4.2. % AQCRs with required network
3.2.4.3. % pollutant-methods that are not unacceptable
3.2.5. NO2 Monitoring
3.2.5.1. AQCR avg. % of required network
3.2.5.2. % AQCRs with required network
3.2.5.3. % pollutant-methods that are not unacceptable
3.2.6. Emissions Reporting
3.2.6.1. % total possible sources (including NEDS verification file) on NEDS
3.2.6.2. % nec. NEDS data items missing
3.3. Completing Plans & Revisions
3.3.1. % required SIP portions completed

Fig. II-5

operational objectives. While Index 2. PROGRESS measures accomplishments during a defined present period, such as a year for an annual application of the system, in relation to objectives for that period, Index 3. ACHIEVEMENT measures all accomplishments up to a point in time, usually the end of the present period, in relation to final objectives. For example, an Index 2 measure looks at the % of stations needed at the beginning of the period that were added during a period, while the comparable Index 3 measure looks at the % of stations in place at the end of the period.

The operational objectives generally follow the lines of those for Index 2: 100% source compliance, and completion of minimum required monitoring networks reporting to SAROAD and emissions data reported to NEDS. There are no long-range objectives for the number of surveillance and enforcement actions, however. And one additional objective is added: completion of all SIP plans and plan revisions required as of the end of the present period. The sub-indices measure achievement of these objectives:

3.1. Source Compliance
3.2. Monitoring and Reporting AQ and Emissions
3.3. Completing Plans and Revisions.

(1) Sub-Index 3.1. Source Compliance measures the cumulative accomplishments of a state in relation to the objective of ensuring source compliance.

Indicator 3.1.1. measures the percentage of all point sources reported in the EPA Formal Reporting System that are in compliance with final emission requirements or are meeting scheduled increments of progress. This indicator shows how well a state has done in bringing about compliance with emission limitations or in keeping sources on schedule in meeting increments of progress.

Indicator 3.1.2. measures the percentage of sources not in compliance with emission requirements that are on compliance schedules. This indicates how well a state has done in putting non-complying sources on compliance schedules.

(2) Sub-Index 3.2. Monitoring and Reporting Air Quality and Emissions measures the cumulative accomplishments of a state in relation to the objective of monitoring and reporting ambient air concentrations and emissions of the criteria pollutants. The first five indicators measure achievement in relation to ambient air quality (AAQ) monitoring and reporting to SAROAD for the five criteria pollutants:

3.2.1. TSP Monitoring
3.2.2. SO_2 Monitoring
3.2.3. CO Monitoring
3.2.4. O_x Monitoring
3.2.5. NO_2 Monitoring.

The last indicator measures achievement in relation to reporting emissions information to NEDS:

3.2.6. Emissions Reporting.

Each of the AAQ monitoring indicators (3.2.1.-3.2.5.) is composed of 3 sub-indicators: (a) AQCR average percentage of minimum network, (b) percentage of AQCRs with complete minimum network, and (c) percentage of pollutant-methods reported that are not unacceptable.

(a) The AQCR average % of the federally required minimum network is equal to the ratio of: the number of stations in an AQCR using an acceptable pollutant-method to monitor a given pollutant that reported sufficient data for one quarter per year to SAROAD during the present period, to the minimum required number of stations in that AQCR, averaged over all AQCRs in the state. In other words, this is the average percentage of the minimum required network in place.

It should be noted that this sub-indicator differs from the comparable sub-indicator under sub-index 2.4., AQCR average % of needed stations added (see p. II-18), in the time period of concern. The latter sub-indicator deals with the percentage of stations needed at the beginning of the present period that were actually added during the period, while the former deals with the status of the monitoring network at the end of the period in relation to the objective of a complete monitoring network.

Like the first sub-indicator under each pollutant indicator of sub-index 2.4., the maximum percentage of the minimum required network for each AQCR is 100%; no credit is given an AQCR for having more than the minimum required number of stations. Thus the maximum computed value for this indicator is 100%, and there is no possibility that an AQCR with more than the minimum required network would make up for another AQCR with less than the minimum required network. The purpose of this sub-indicator is to show how far the AQCRs in the state are from complete networks.

(b) The percentage of AQCRs with complete minimum network is equal to the ratio of: the number of AQCRs that have at least the federal minimum required number of stations, to the number of AQCRs in the state. This sub-indicator together with the previous sub-indicator accounts for states that located some stations in each AQCR as well as states that concentrated their stations in certain AQCRs.

Again, this sub-indicator is similar to the second sub-indicator of each of the first five indicators of sub-index 2.4., the percentage of AQCRs needing stations that achieved complete networks, except for the time period of concern. The former deals with the percentage of all AQCRs in the state that have attained the minimum network as of the end of the present period, while the latter deals with the percentage of AQCRs with less than the required network at the beginning of the present period that attained the minimum network during the period.

(c) The percentage of pollutant-methods reported that are not unacceptable is equal to the ratio of: the number of monitoring sites reporting to SAROAD and using pollutant-methods classified by SAROAD as acceptable (federal reference method or equivalent) or unapproved (equivalency not yet determined), to the total number of monitoring sites reporting to SAROAD (including those using pollutant-methods that have been declared unacceptable). A list of pollutant-methods and their acceptability classification is given in Appendix II-B.

Indicator 3.2.6. looks at reporting of emissions information to NEDS and is composed of 2 sub-indicators:

(a) Sub-indicator 3.2.6.1. is a measure of the percentage of sources in a state that are not in NEDS but should possibly be in NEDS. It is equal to the ratio of: the number of sources in NEDS, to the number in NEDS plus the number of sources in the NEDS verification file. The NEDS verification file is a list compiled from various non-EPA sources, of point source facilities not in NEDS that need to be investigated vis-a-vis the necessity of putting them in NEDS.

(b) Sub-indicator 3.2.6.2. measures the percentage of necessary NEDS data items for all sources in a state that are missing as of the end of the present period. Necessary NEDS data items, selected after consultation with EPA personnel, are those pieces of information requested on NEDS point source forms that are considered the most important to meet the basic purposes of NEDS. All items requested on the NEDS point source form are considered necessary except for: city, contact, plume height, compliance schedule year and month, compliance status update year, month and day, and ECAP.

(3) Sub-Index 3.3. Completing Plans and Revisions is composed of 1 measure, indicator 3.3.1., which measures the percentage of the number of SIP portions due to be completed by a state by the end of the present period, that was actually completed by that time.

An SIP portion is a regulatory or non-regulatory part of a statewide plan or plan for any distinct area within a state (e.g., AQCR, AQMA, TCP area), as categorized in the SIP Progress Report. As this categorization changes, the definition of a portion may change accordingly.

For the sake of simplicity it is assumed that every AQCR in a state needs one of the SIP portions named in the SIP Progress Report. The number of completed portions is then equal to: the total possible number of required SIP portions (number of AQCRs times the number of portions) minus the number of portions declared deficient by EPA, including portions EPA has promulgated in the absence of state completion and adoption of an acceptable portion. In effect, a portion that is in fact not required for a state or for AQCRs within a state (such as a TCP) is considered to have been completed. On the other hand, a deficiency in a portion of a statewide plan is considered a deficiency for all AQCRs in the state.

2. Need Indices: Measure the need of a state at the end of the present period in relation to national goals and objectives. The performance indices measure state status and activities in terms of one state's activities or status in relation to its own situation, and computed values are usually percentages (e.g., AAQI in relation to AAQ problem at the beginning, number of sources not in compliance in relation to total number of sources). The need indices, in contrast, measure state status in actual or absolute terms (e.g., total AAQ deviation, number of sources not in compliance). There are two need indices, one relating to AAQ and emissions goals and the other to operational objectives.

a. Index 4. PROBLEM (see flowchart, Figure II-6, on p. II-29)

Index 4 measures the need of a state at the end of the present period in relation to air quality and emission goals. It consists of three sub-indices:

4.1. Ambient Air Quality Problem
4.2. Emissions and Emission Sources
4.3. Emission Reduction Needed.

(1) Sub-Index 4.1. Ambient Air Quality Problem measures the need of a state at the end of the present period in relation to the national primary ambient air quality standards and the population exposed to ambient air quality exceeding standards. The sub-index is composed of five indicators, each measuring the ambient air quality (AAQ) problem in relation to one of the five criteria pollutants:

4.1.1. TSP AAQ Problem
4.1.2. SO_2 AAQ Problem
4.1.3. CO AAQ Problem
4.1.4. O_x AAQ Problem
4.1.5. NO_2 AAQ Problem.

Each of the indicators is composed of 2 types of sub-indicators: (a) air quality deviation indication (AQDI) for each primary pollutant-standard (2 standards each for TSP, SO_2, and CO, and 1 standard each for O_x and NO_2), and (b) population in AQCRs with positive AQDI for each primary pollutant-standard.

(a) The air quality deviation indication for a particular pollutant-standard is equal to the sum of the percentage deviations of measured air quality above (worse than) the standard. This sum accounts for the magnitude of deviations

FLOWCHART FOR INDEX 4. PROBLEM

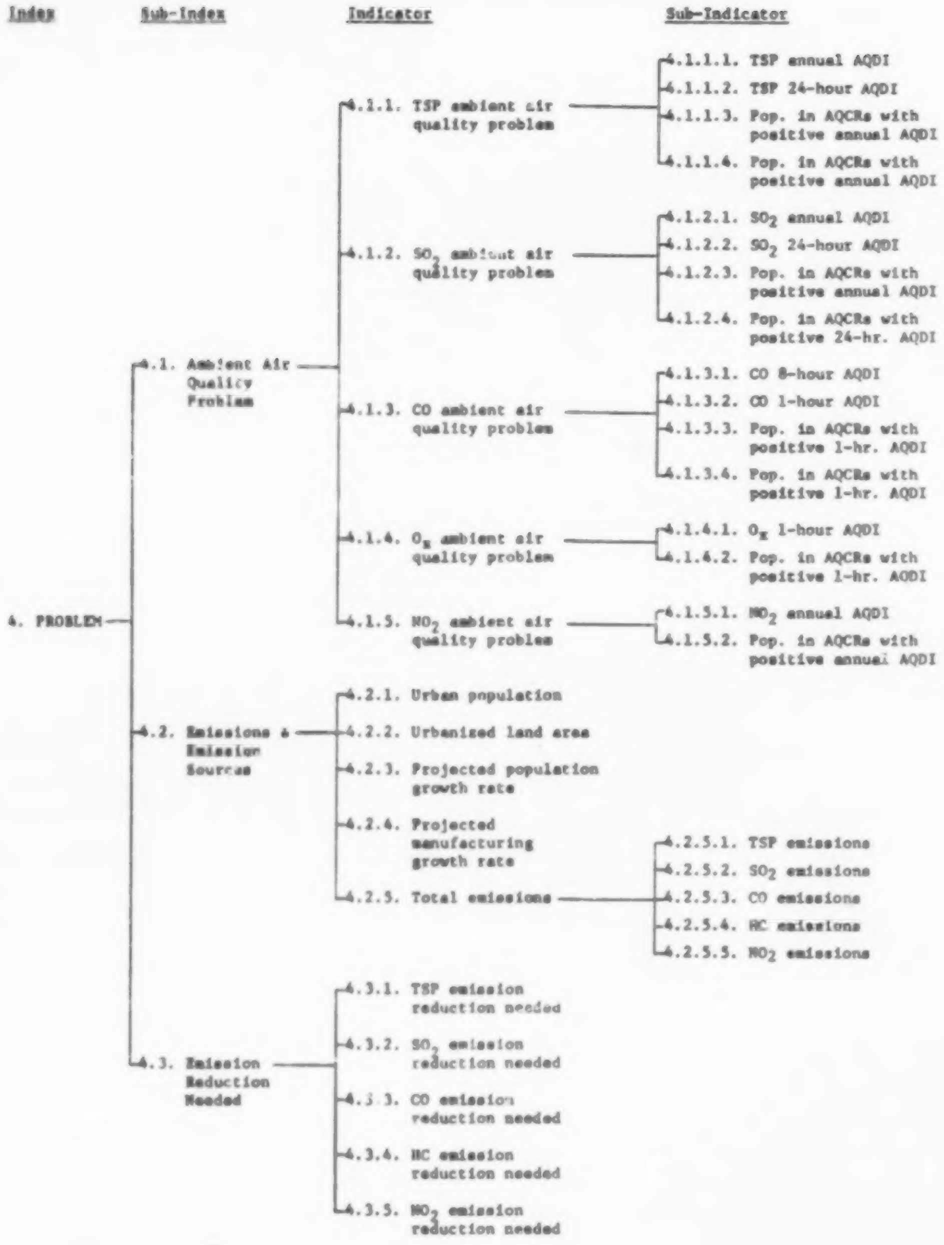

Index
Sub-Index
Indicator
Sub-Indicator
4. PROBLEM
4.1. Ambient Air Quality Problem
4.1.1. TSP ambient air quality problem
4.1.1.1. TSP annual AQDI
4.1.1.2. TSP 24-hour AQDI
4.1.1.3. Pop. in AQCRs with positive annual AQDI
4.1.1.4. Pop. in AQCRs with positive annual AQDI
4.1.2. SO_2 ambient air quality problem
4.1.2.1. SO_2 annual AQDI
4.1.2.2. SO_2 24-hour AQDI
4.1.2.3. Pop. in AQCRs with positive annual AQDI
4.1.2.4. Pop. in AQCRs with positive 24-hr. AQDI
4.1.3. CO ambient air quality problem
4.1.3.1. CO 8-hour AQDI
4.1.3.2. CO 1-hour AQDI
4.1.3.3. Pop. in AQCRs with positive 1-hr. AQDI
4.1.3.4. Pop. in AQCRs with positive 1-hr. AQDI
4.1.4. O_x ambient air quality problem
4.1.4.1. O_x 1-hour AQDI
4.1.4.2. Pop. in AQCRs with positive 1-hr. AQDI
4.1.5. NO_2 ambient air quality problem
4.1.5.1. NO_2 annual AQDI
4.1.5.2. Pop. in AQCRs with positive annual AQDI
4.2. Emissions & Emission Sources
4.2.1. Urban population
4.2.2. Urbanized land area
4.2.3. Projected population growth rate
4.2.4. Projected manufacturing growth rate
4.2.5. Total emissions
4.2.5.1. TSP emissions
4.2.5.2. SO_2 emissions
4.2.5.3. CO emissions
4.2.5.4. HC emissions
4.2.5.5. NO_2 emissions
4.3. Emission Reduction Needed
4.3.1. TSP emission reduction needed
4.3.2. SO_2 emission reduction needed
4.3.3. CO emission reduction needed
4.3.4. HC emission reduction needed
4.3.5. NO_2 emission reduction needed

Fig. II-6

measured above a standard, and the number of air quality values registering a deviation above a standard.

The sum can be corrected to account for the completeness of a state's monitoring network, by dividing the sum by the ratio of: the number of stations reporting, to the federally required minimum number of stations (see Section B for more detailed computation instructions). The assumption behind such a correction factor is that AQ measured by the monitoring network in place and reporting to SAROAD is in direct proportion to what AQ would be measured by a "complete (i.e., minimum required)" network. The sum of deviations above a standard is thus proportionately increased or decreased according to the percentage of the complete sampling that was reported to SAROAD. Another standard for a "complete" network, such as the number of stations proposed in the SIP could be used in place of the federally required minimum.

Several drawbacks to the AQDI can be mentioned:

(1) No judgment can be made on the proper spatial distribution of the monitoring stations within each AQCR, and therefore it must be assumed that measured air quality is truly representative of air quality in each AQCR;

(2) For a state that measured no deviation above a standard, the AQDI could never be increased above 0 by the correction factor, even if the state had less than a "representative" network (however, because stations probably were initially located in areas of expected

maximum concentrations, understating the air quality deviation should not be a problem);

(3) the AQDI using the correction factor may overstate air quality deviation in AQCRs with less than the minimum required network if these stations are measuring the heaviest concentration of a pollutant;

(4) As presently constructed, the AQDI does not distinguish between source-oriented and population-oriented monitoring sites. Sites coded as source-oriented were not eliminated, because it was felt that the reliability of such coding varied greatly from state to state. However, such a distinction can easily be built into the measure if desired.

It should be noted that because the state is the geographic unit of interest here, the AQDI for all AQCRs in a state are summed to yield the AQDI for the state. This state AQDI masks the distribution and relative local severity of ambient air quality problems, so that a state with 1 AQCR with a severe problem might have an AQDI equal to another state in which all the AQCRs have a slight problem. Like all measures utilized in the system, interpretation of the meaning of an AQDI value requires more detailed investigation and explanation than is intended here.

Finally, calculation of the AQDI requires data that is not always available. Many states may not report sufficient data to SAROAD to calculate an AQDI for any or all of their AQCRs; many states are not required by the federal minimum required network to report any data, especially for CO and O_x. For these states no AQDI can be listed (as opposed to states with sufficient data but with an AQDI equal to 0) and any comparison of state values must be among those with some data.

(b) Population in AQCRs with positive AQDI for a particular pollutant-standard measures the extent of population exposure to AAQ exceeding a standard. As for the AQDI, there are 2 population sub-indicators each for TSP, SO_2 and CO (one for each of 2 standards), and one each for O_x and NO_2.

(2) Sub-Index 4.2. Emissions and Emission Sources looks at current and projected levels of factors that are associated with emissions, in the first four indicators:

4.2.1. Urban Population
4.2.2. Urbanized Land Area
4.2.3. Projected Population Growth Rate
4.2.4. Projected Manufacturing Growth Rate.

The last indicator deals directly with current emissions:

4.2.5. Total Emissions.

Indicator 4.2.1. gives the urban population in the state and is an indication of the number of sources of emissions coming from urban activity. The Census Bureau definition of urbanized area population is used: population of an area containing a city of 50,000 or more population plus the surrounding closely settled incorporated and unincorporated areas which meet Census Bureau criteria of population size or density (urbanized areas differ from SMSAs chiefly in excluding the rural portions of SMSA counties and those places separated by rural territory from densely populated fringe around the central city).

Indicator 4.2.2. shows the amount of land over which urban emission-generating activities take place and like 4.2.1. is an indication of urban sources of emissions. Urbanized land area is equivalent to the total area in all SMSAs in the state, and as such it is not necessarily equivalent to the area on which the urban population resides. Another measure of land area, such as the area of Census defined urbanized areas (the more densely settled parts of SMSAs), can be substituted if data is available.

Indicators 4.2.3. and 4.2.4. attempt to measure future emissions problems by estimating the growth rate of two major types of emissions sources, population (area sources) and manufacturing activity (point sources). The population growth rate and the rate of growth of manufacturing activity are estimated for a given period in the future, such as 5 or 10 years. Choice of the time period depends on data availability, reliability of various forecasts, and air program-related deadlines such as air quality maintenance analysis and planning (see Section B, p. II-76, for possible sources of estimates).

Indicator 4.2.5. looks at current levels of emissions (tons per year) for the criteria pollutants and is composed of 5 sub-indicators, one for each pollutant. Although it is discussed in Section B, Methodology, it should be pointed out at this point also that the actual values of emissions for the pollutant sub-indicators are not summed to yield the value for the indicator since it cannot be assumed that a ton of TSP is equivalent to a ton of CO (see Section B for discussion of scoring).

(3) Sub-Index 4.3. Emission Reduction Needed looks at emissions at the end of the period in relation to emission goals (the level of emissions needed to attain ambient air quality standards). There are 5 indicators, one each for emission reduction needed for a criteria pollutant:

4.3.1. TSP Emission Reduction Needed
4.3.2. SO_2 Emission Reduction Needed
4.3.3. CO Emission Reduction Needed
4.3.4. HC Emission Reduction Needed
4.3.5. NO_2 Emission Reduction Needed.

b. Index 5. OPERATIONAL REQUIREMENTS (see flowchart, Figure II-7, on p. II-35)

Index 5 measures in actual terms the need of a state at the end of the present period in relation to operational objectives. It consists of 3 sub-indices, each measuring need in relation to an operational objective:

5.1. Source Compliance and Enforcement
5.2. Monitoring and Reporting Air Quality and Emissions
5.3. Completing Plans and Revisions.

(1) Sub-Index 5.1. Source Compliance and Enforcement measures the need of a state at the end of the present period in relation to source compliance and enforcement objectives. The purpose of the sub-index is to indicate the relative amounts of time and effort that will be required of state and local agencies in order to ensure source compliance. There are 4 indicators that comprise the sub-index:

FLOWCHART FOR INDEX 5. OPERATIONAL REQUIREMENTS

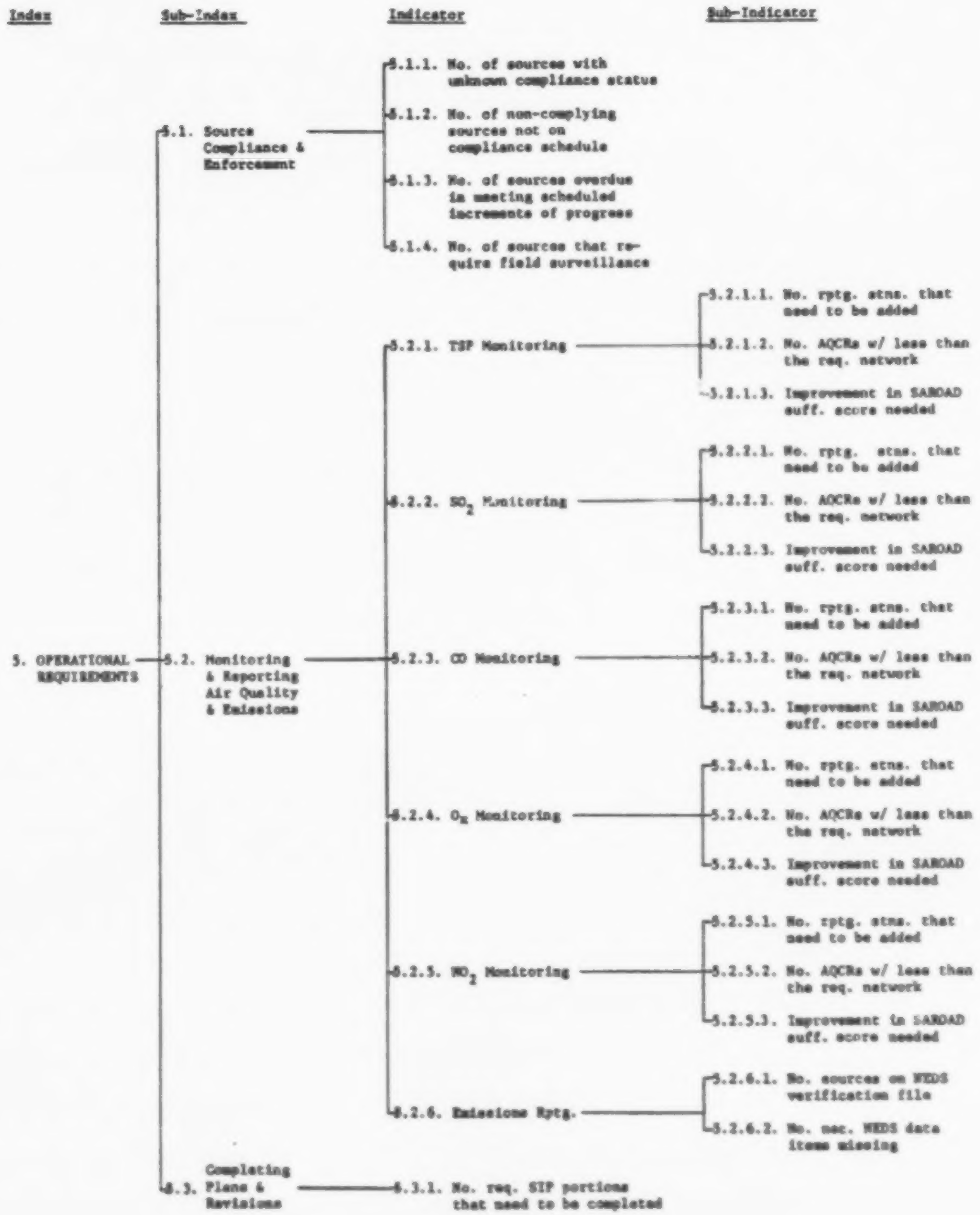

Index
Sub-Index
Indicator
Sub-Indicator
5. OPERATIONAL REQUIREMENTS
5.1. Source Compliance & Enforcement
5.1.1. No. of sources with unknown compliance status
5.1.2. No. of non-complying sources not on compliance schedule
5.1.3. No. of sources overdue in meeting scheduled increments of progress
5.1.4. No. of sources that require field surveillance
5.2. Monitoring & Reporting Air Quality & Emissions
5.2.1. TSP Monitoring
5.2.1.1. No. rptg. stns. that need to be added
5.2.1.2. No. AQCRs w/ less than the req. network
5.2.1.3. Improvement in SAROAD suff. score needed
5.2.2. SO_2 Monitoring
5.2.2.1. No. rptg. stns. that need to be added
5.2.2.2. No. AQCRs w/ less than the req. network
5.2.2.3. Improvement in SAROAD suff. score needed
5.2.3. CO Monitoring
5.2.3.1. No. rptg. stns. that need to be added
5.2.3.2. No. AQCRs w/ less than the req. network
5.2.3.3. Improvement in SAROAD suff. score needed
5.2.4. O_x Monitoring
5.2.4.1. No. rptg. stns. that need to be added
5.2.4.2. No. AQCRs w/ less than the req. network
5.2.4.3. Improvement in SAROAD suff. score needed
5.2.5. NO_2 Monitoring
5.2.5.1. No. rptg. stns. that need to be added
5.2.5.2. No. AQCRs w/ less than the req. network
5.2.5.3. Improvement in SAROAD suff. score needed
5.2.6. Emissions Rptg.
5.2.6.1. No. sources on NEDS verification file
5.2.6.2. No. nec. NEDS data items missing
5.3. Completing Plans & Revisions
5.3.1. No. req. SIP portions that need to be completed

Fig. II-7

5.1.1. No. of sources with unknown compliance status
5.1.2. No. of non-complying sources not on compliance schedules
5.1.3. No. of sources overdue in meeting scheduled increments of progress
5.1.4. No. of sources that require field surveillance.

Indicator 5.1.1. counts the number of major point sources whose compliance status with regard to final emission requirements or to meeting scheduled increments of progress is unknown, as an indication of the number of sources whose status will have to be investigated and determined.

Indicator 5.1.2. counts major point sources not in compliance with emission requirements and not on compliance schedules. These sources must be placed on compliance schedules.

Indicator 5.1.3. counts major point sources that have compliance schedules but which have not met a scheduled increment of progress. These sources must be brought into compliance with the missed increment or the schedules must be revised.

Indicator 5.1.4. is an estimate of the total number of sources that may require field surveillance of some kind. The number of manufacturing facilities in the state in the Dun & Bradstreet DMI file was used (see p. II-14 for discussion of alternatives rejected).

(2) Sub-Index 5.2. Monitoring and Reporting Air Quality and Emissions measures the need of a state in relation to the objectives of monitoring and reporting ambient air quality (AAQ) data to SAROAD and reporting emissions data to NEDS. The purpose of the sub-index is to indicate the relative amounts of time and resources that will be required of state and local agencies in order to complete the federally required minimum AAQ monitoring network and the NEDS

file. The first five indicators refer to monitoring and reporting AAQ for the five criteria pollutants:

5.2.1. TSP Monitoring
5.2.2. SO_2 Monitoring
5.2.3. CO Monitoring
5.2.4. O_x Monitoring
5.2.5. NO_2 Monitoring.

The last indicator refers to reporting of source and emissions information to NEDS:

5.2.6. Emissions Reporting.

Each of the first five indicators relating to AAQ monitoring for a criteria pollutant is composed of 3 sub-indicators: (a) number of stations needed to complete the minimum network, (b) number of AQCRs with less than the minimum network reporting, and (c) improvement needed in SAROAD sufficiency score.

(a) The number of stations needed to complete the minimum network for a given pollutant is equal to the minimum required number of stations in each AQCR minus the number of stations reporting sufficient data for at least 1 quarter per year to SAROAD, if this latter number is less than the minimum required number, summed over all AQCRs in the state. An AQCR with more than the minimum required number of stations does not make up for another AQCR with less than the minimum required number.

(b) The number of AQCRs with less than the minimum required network for each pollutant is equal to the number of station-quarters of insufficient data reported to SAROAD (see p. II-20 for definition of sufficiency). While the other two sub-indicators deal with need relative to network completion, this sub-indicator is concerned with sufficiency of data reported from stations in place.

Indicator 5.2.6. measures the need for reporting of source and emissions information to NEDS, and is composed of 2 sub-indicators. Sub-indicator 5.2.6.1. counts the number of sources that are on the NEDS verification file (see p. II-26 for definition) and may thus need to be put in NEDS. Sub-indicator 5.2.6.1. counts the number of necessary data items (see p. II-26 for definition) that need to be completed in order to have all necessary information for sources in NEDS.

(3) Sub-Index 5.3. Completing Plans and Revisions has 1 sub-indicator, 5.3.1., which measures the need of a state at the end of the present period in relation to completing all necessary SIP portions and revisions. This includes SIP portions that should have been completed by the end of the present period as well as those portions that will need to be completed and approved during the next period (see p. II-27 for definition of "SIP portion").

3. State Background Information: In addition to measures of performance and need, demographic and expenditure information that provides some perspective on the states is collected for each state. A list of the information collected is presented on the following page. Actual figures for the states are given in Appendix II-B. These data are not used as the basis for any scoring, except for urbanized area population and SMSA land area (index 4).

STATE BACKGROUND INFORMATION

1. Total population: (a) Civilian (County-City Data Book)
   (1000) (b) Including military (Statistical Abstract of the U.S.)

2. Projected population, 1980: (a) Series C (Two Census Bureau population
   projections, based on different
   (1000) (b) Series E. birth rate assumptions)

3. Urban population (1000) = pop. in urbanized areas + places of 2500 and more.

4. Percentage of population that is urban.

5. SMSA population (1000).

6. Percentage of population that is in SMSAs.

7. Urbanized area population = pop. of densely settled areas of SMSAs (1000).

8. Total land area (sq. mi.).

9. SMSA land area (sq. mi.).

10. Overall density = total pop./total land area.

11. SMSA density = SMSA pop./SMSA land area.

12. # of AQCRs of priority I (sum over all pollutants).

13. Population in AQCRs of priority I (sum over all pollutants) (1000).

14. Total air pollution control agency expenditures ($1000).

15. Total expenditures/total population.

16. Total expenditures/urban population.

17. Total expenditures/SMSA population.

18. Total expenditures/UA population.

19. Total expenditures/total land area.

20. Total expenditures/SMSA land area.

21. Total expenditures/overall land density.

22. Total expenditures/SMSA density.

23. Total expenditures/population in AQCRs of priority I (sum over all pollutants).

24. Percentage deviation of 1973 heating degree-days from 30-yr. Normal $\left(\frac{\text{Avg.-Normal}}{\text{Normal}}\right)$ (averaged over all weather stations in state).

    (+ = higher heating degree-days = colder
    - = lower heating degree-days = warmer than normal)

Total air pollution control agency expenditure is equal to the annual control program budgets for all state and local control agencies in a state, which is the sum of federal and non-federal funds (including equivalent value of EPA assignees) plus special contract support funds and demonstration grants.

B. Methodology

This section describes the steps involved in calculating values and scores for the measures described in the previous section. Briefly the steps are:

(1) The states that will be analyzed are chosen.

(2) The weighting scheme is established. At each level of aggregation weights for each measure are assigned according to the relative contribution of component sub-indicators to an indicator, of component indicators to a sub-index, and of component sub-indices to an index. For any given index, sub-index, or indicator, weights for all its components should sum to 1.0 (or 100%).

(3) The desired number of scoring intervals and the score to be assigned to each interval are chosen. The number of intervals can range from two intervals (above and below a mean), or four intervals representing quartiles, or ten intervals representing deciles, to any other number. The intervals can be assigned any logical progression of numbers as scores (e.g., quartiles can be assigned scores 1, 2, 3, and 4; or if it is desired that each succeeding quartile have a score twice the score of the last quartile, quartiles can be assigned scores 1, 2, 4, and 8, etc.). The same number of scoring intervals and the same scores are used for all measures and all states to ensure comparability from measure to measure.

(4) For each measure that is made up of individual data items (i.e., sub-indicators, or, if there are no sub-indicators for a particular indicator, indicators), the values for all states being analyzed are computed from the component data items (discussion of the individual sub-indicators and indicators is given later in this section, with reference to worksheets and detailed instructions in the Workbook).

(5) For each measure the computed values are converted into scores in the following manner:

(a) The range of values for which scores will be given is established. Where possible, this is the range of all possible values, for example, 0 to 100% final source compliance. If no such range of possible values is evident, for example, for population or percent improvement, the range of actual values is determined for all states for which comparison of results is desired, such as all states in the nation for a national perspective.

(b) The scale by which the range of values will be divided into the desired number of intervals, such as an arithmetic scale or geometric scale, is chosen. The important point to remember here is that the scale should make it possible to make meaningful distinctions among states according to the values computed for the sub-indicator or indicator. Thus a scale should be avoided that results in a situation in which all or most units being compared are grouped together at one end of the scale and thus a large proportion of the units receive the same score. One way to decide what scale to use is to list all computed values, look for groupings of states and natural breakpoints between groupings, and then try out an arithmetic or geometric scale. The decision as to whether a given spread of values is satisfactory is subjective.

(c) Using the chosen scale, the range of values for each scoring interval is determined.

(d) The scoring intervals into which fall the values for all the states being compared are determined, and the appropriate scores are assigned.

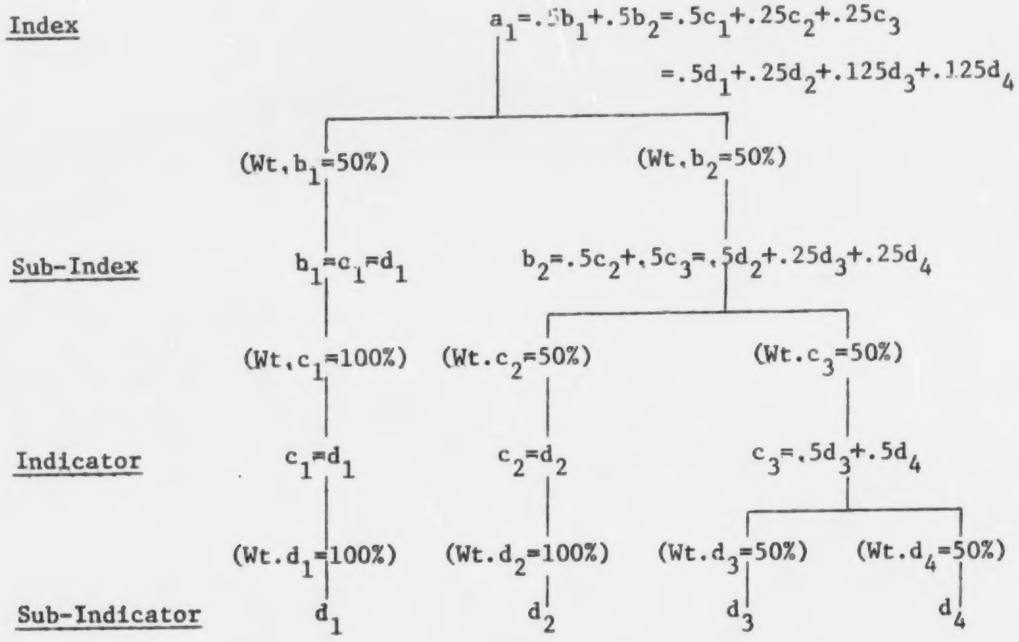
(6) Each score for a component is multiplied by its weight to yield a weighted score. If a particular value and score for a given state cannot be computed because of insufficient data, the component weights for that state are reallocated among those components for which values and scores can be computed, in the same proportion as was originally assigned (see Section E, p. II-132 for further discussion).

(7) Steps (4) computing values, (5) converting values to scores, and (6) weighting scores, are repeated for all components of a given measure.

(8) The weighted scores for all components of a given measure are summed to obtain the score of the measure.

(9) Steps (7) computing weighted scores of all components, and (8) summing weighted scores of all components are repeated until the desired highest level of aggregation is reached.

A simplified diagram showing the application of weights and summing of weighted scores at each level is presented below.


Index
$a_1 = .5b_1 + .5b_2 = .5c_1 + .25c_2 + .25c_3$
$= .5d_1 + .25d_2 + .125d_3 + .125d_4$
(Wt. b_1 = 50%)
(Wt. b_2 = 50%)
Sub-Index
$b_1 = c_1 = d_1$
$b_2 = .5c_2 + .5c_3 = .5d_2 + .25d_3 + .25d_4$
(Wt. c_1 = 100%)
(Wt. c_2 = 50%)
(Wt. c_3 = 50%)
Indicator
$c_1 = d_1$
$c_2 = d_2$
$c_3 = .5d_3 + .5d_4$
(Wt. d_1 = 100%)
(Wt. d_2 = 100%)
(Wt. d_3 = 50%)
(Wt. d_4 = 50%)
Sub-Indicator
d_1
d_2
d_3
d_4

The remainder of this section describes the calculation procedures (steps (4) through (9)) for the measures within each index. The discussion follows the outline of indices and components used in Section A. The sources of the data from which values are computed are also given; additional information concerning these sources are given in Appendix II-A.

1. Performance Indices

a. Index 1. GOAL ATTAINMENT (see flowchart, Figure II-3, p. II-8)

Each sub-index measures goal attainment for one of five criteria pollutants, and is composed of 3 indicators: (1) AAQ improvement, (2) emission reduction, and (3) PRMS flags.

(1) Ambient Air Quality Improvement (AAQI) (1.1.1. TSP, 1.2.1. SO_2, 1.3.1. CO, 1.4.1. O_x, 1.5.1. NO_2): Following detailed instructions and worksheet #1 in the Workbook (Appendix II-E), the sum of all observed values (H) and the sum of all percent deviations above the standard (I) for both the previous and present period of evaluation are computed for each pollutant-standard, using only stations which reported data in both periods. The data for both (H) and (I) can be obtained from the Monitoring and Trends Report or from SAROAD printouts. (It should be noted that the sum of percent deviations for the present period calculated for Index 1 and the AQDI for the present period computed for Index 4 and described on page II-66 will differ because of the need in the former to compare only values for stations that reported in both periods.)

For each state with some deviation above a standard (I>0) in both periods, the sums of deviations (I) for both periods, summed over all AQCRs in the state, are compared to yield the value for each AAQI sub-indicator:

1.1.1.1.(a)	TSP annual	1.3.1.1.(a)	CO 8-hour
1.1.1.2.(a)	TSP 24-hour	1.3.1.2.(a)	CO 1-hour
1.2.1.1.(a)	SO_2 annual	1.4.1.1.(a)	O_x 1-hour
1.2.1.2.(a)	SO_2 24-hour	1.5.1.1.(a)	NO_2 annual.

The value of each sub-indicator is computed by means of the following formula:

$$\frac{\text{Previous Period (I)} - \text{Present Period (I)}}{\text{Previous Period (I)}} \times 100.$$

For each state with no deviation ($I \leq 0$) in either period, the sum of all observed values (H) for both periods are compared to yield the value for each AAQI sub-indicator:

1.1.1.1.(b)	TSP annual	1.3.1.1.(b)	CO 8-hour
1.1.1.2.(b)	TSP 24-hour	1.3.1.2.(b)	CO 1-hour
1.2.1.1.(b)	SO_2 annual	1.4.1.1.(b)	O_x 1-hour
1.2.1.2.(b)	SO_2 24-hour	1.5.1.1.(b)	NO_2 annual.

The value of each of these sub-indicators is computed by means of the following equation:

$$\frac{\text{Previous Period (H)} - \text{Present Period (H)}}{\text{Previous Period (H)}} \times 100.$$

It should be noted that for any given state and any given pollutant-standard, a value is computed for either improvement in air quality deviation above the standard (a) or improvement in air quality not exceeding the standard (b).

The range of values to be used for each AAQI sub-indicator is listed on Table II-1. Values for the AAQI sub-indicators can range from negative improvement (worsening of AQ) to positive improvement and can conceivably be any real number. Because there is no predetermined range of possible scores, the ranges of actual

Table II-1 . Converting Values to Scores
Index 1. GOAL ATTAINMENT

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
AQ Deviation Improvement Sub-Indicators								
1.1.1.1. (a)TSP								
1.1.1.2. (a)TSP								
1.2.1.1. (a)SO_2								
1.2.1.2. (a)SO_2								
1.3.1.1. (a)CO								
1.3.1.2. (a)CO								
1.4.1.1. (a)O_x								
1.5.1.1. (a)NO_2								
AQ Improvement Sub-Indicators								
1.1.1.1. (b)TSP								
1.1.1.2. (b)TSP								
1.2.1.1. (b)SO_2								
1.2.1.2. (b)SO_2								
1.3.1.1. (b)CO								
1.3.1.2. (b)CO								
1.4.1.1. (b)O_x								
1.5.1.1. (b)NO_2								
Emission Reduction Indicators:								
1.1.2. TSP								
1.2.2. SO_2								
1.3.2. CO								
1.4.2. HC								
1.5.2. NO_2								
PRMS Indicators:								
1.1.3. TSP								
1.2.3. SO_2								
1.3.3. CO								
1.4.3. O_x								
1.5.3. NO_2								

values computed for all states is determined. Also on Table II-1, the scales to be used and the ranges of values for the scoring intervals are determined (spaces are provided on the form for four intervals but any number can be used).

In accordance with the ranges of values for the scoring intervals, the computed values for the AAQI sub-indicators are converted to scores on Table II-2 (one per state), the sub-indicators for each pollutant are weighted and summed to yield the score for the AAQI indicator for each pollutant.

(2) Emission Reduction (1.1.2. TSP, 1.2.2. SO_2, 1.3.2. CO, 1.4.2. O_x, 1.5.2. NO_2): Using worksheet #2 in the Workbook (Appendix II-E), the percent of needed emission reduction attained for each pollutant from the previous period to the present period is computed as follows:

$$\frac{\begin{pmatrix}\text{Previous Period Total}\\ \text{Emission Rates (T/yr.)}\end{pmatrix} - \begin{pmatrix}\text{Present Period Total}\\ \text{Emission Rates (T/yr.)}\end{pmatrix}}{\begin{pmatrix}\text{Previous Period Total}\\ \text{Emission Rates (T/yr.)}\end{pmatrix} - \begin{pmatrix}\text{Emission}\\ \text{Goal (T/yr.)}\end{pmatrix}}$$

Emission rates can be obtained from the National Emissions Report or NEDS printouts; emission goals can be gotten from the SIP automated information system.

The resultant value can be negative if present period emissions reported to NEDS are greater than previous period emissions. Currently it is not possible to eliminate emissions from new sources added to NEDS from the previous to the present period. Thus it is possible that increased emission levels in the present period reflect new sources added to NEDS, rather than increased

Table II- 2. Scoring and Weighting
Index 1. GOAL ATTAINMENT

STATE: REGION:

Measure	Sub-Indicator				Indicator				Sub-Index			Index
	Value	Score	Wt.	Wtd. Score	Value	Score	Wt.	Wtd. Score	Score	Wt.	Wtd. Score	Score
1.1.1.1.(a)												
1.1.1.1.(b)												
1.1.1.2.(a)												
1.1.1.2.(b)												
1.1.1.AAQI												
1.1.2.E.R.												
1.1.3.PRMS												
1.1.TSP												
1.2.1.1.(a)												
1.2.1.1.(b)												
1.2.1.2.(a)												
1.2.1.2.(b)												
1.2.1.AAQI												
1.2.2.E.R.												
1.2.3.PPMS												
1.2.SO_2												
1.3.1.1.(a)												
1.3.1.1.(b)												
1.3.1.2.(a)												
1.3.1.2.(b)												
1.3.1.AAQI												
1.3.2.E.R.												
1.3.3.PRMS												
1.3.CO												
1.4.1.1.(a)												
1.4.1.1.(b)												
1.4.1.AAQI												
1.4.2.E.R.												
1.4.3.PRMS												
1.4.O_x/HC												
1.5.1.1.(a)												
1.5.1.1.(b)												
1.5.1.												
1.5.2.												
1.5.3.												
1.5.NO_2												
1.GOAL ATTAINMENT												

emissions from the previous period sources. However, ongoing efforts by NADB staff may soon make it possible to follow changes in emissions of a given set of sources. Until that is possible, the number of sources in NEDS in the previous and present periods can give an indication of the significance of new sources in accounting for changes in total emissions.

If needed emission reduction is zero or less, that is, if previous period emissions are less than the emission goals, no value is computed for the indicator.

Values for the emission reduction indicator for each pollutant probably would not exceed 100% of needed reduction attained. However, it is possible that the emission goal could be exceeded and the value would be more than 100%. On the other end of the range, there can be negative reduction (increase in emissions) especially since new sources can be added to NEDS. The range of computed values or a range from the lowest computed value to 100% if no computed values exceeds 100%, is listed on Table II-1. In addition, the range of values for each scoring interval is determined. On Table II-2, the computed indicator values for each state are converted to scores.

(3) PRMS Flags (1.1.3. TSP, 1.2.3. SO_2, 1.3.3. CO, 1.4.3. O_x, 1.5.3. NO_2): Using worksheet #3 in the Workbook (Appendix II-E), the number of flags for each pollutant-standard in the present period is calculated. This is the number of monitoring sites with four consecutive quarters, ending in the present period, of data reported to SAROAD for which the PRMS analysis indicated

a "potential deficiency." Data can be obtained from the PRMS Analytical Summary Report.

For each pollutant the indicator value is the total number of flags for all standards for that pollutant. Because the number of flags depends greatly on the number of sites for which data were reported to SAROAD, the total number of sites reporting sufficient data for four consecutive quarters ending in the present period is also calculated.

The PRMS flags indicators can have values ranging from zero to any whole positive number; therefore the range of values for each pollutant is from zero to the largest number computed for a state and is listed on Table II-1. The range of values for each scoring interval is determined, and on Table II-2 computed values are converted to scores.

Once the scores have been determined for all the indicators for each pollutant sub-index, the indicator scores are weighted and summed on Table II-2 to obtain sub-index scores for each state. The sub-index scores for the pollutants are in turn weighted and summed for a score for Index 1 for each state.

b. Index 2. PROGRESS (see flowchart, Figure II-4, p. II-11)

(1) Sub-Index 2.1. Meeting MBO Commitments

Indicator 2.1.1. Output Category 1 is composed of 8 sub-indicators whose values are computed according to worksheet #4. Data are derived from the State Activity Report.

Computed values for these sub-indicators range from a negative value to any positive value; the range of values computed for all units is determined and listed on Table II-3. The scale and ranges of values for the scoring intervals are chosen and also listed on Table II-3. Each sub-indicator value computed for each state is converted to a score and weighted on Table II-4, and weighted sub-indicator scores are summed to yield the score for indicator 2.1.1. Because there is only 1 indicator under sub-index 2.1., the score for indicator 2.1.1. is also the score for sub-index 2.1.

(2) Sub-Index 2.2. Source Compliance

Values for indicators 2.2.1. and 2.2.2. are computed according to worksheet #4, with data derived from the State Activity Report.

Computed values for the percentages of non-complying sources brought into compliance (2.2.1.) and unknown sources whose status was determined (2.2.2.) usually do not exceed 100% or fall below 0. However, the number of non-complying or unknown sources is the number as of the beginning of the present period. It is possible that during the period new sources not originally counted are added to the non-complying or unknown categories, or sources change their status to unknown or non-complying. A state thus may have brought into compliance or determined the compliance status of a greater number of sources than the original number of non-complying or unknown sources. If computed values thus exceed 100% or fall below 0, the range of all actual values is used; if no value is greater than 100% or less than 0, a range of 0 to 100 is used.

Table II- 3. Converting Values to Scores
Index 2. PROGRESS

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
MBO Commitments								
Sub-Indicators:								
2.1.1.1.								
2.1.1.2.								
2.1.1.3.								
2.1.1.4.								
2.1.1.5.								
2.1.1.6.								
2.1.1.7.								
2.1.1.8.								
Source Compliance								
Indicators:								
2.2.1.								
2.2.2.								
Surveillance & Enforcement Actions								
Indicators:								
2.3.1.								
2.3.2.								
2.3.3.								
Enforcement								
Sub-indicators:								
2.3.4.1.								
2.3.4.2.								
2.3.4.3.								

Table II- 3. Converting Values to Scores
(continued) Index 2. PROGRESS

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
Monitoring & Reporting % of Needed Stations Added Sub-Indicators:								
2.4.1.1.								
2.4.2.1.								
2.4.3.1.								
2.4.4.1.								
2.4.5.1.								
% of Needed AQCRs Attained Sub-Indicators:								
2.4.1.2.								
2.4.2.2.								
2.4.3.2.								
2.4.4.2.								
2.4.5.2.								
SAROAD Sufficiency Score Sub-Indicators:								
2.4.1.3.								
2.4.2.3.								
2.4.3.3.								
2.4.4.3.								
2.4.5.3.								
Emissions Rptg. Sub-Indicator:								
2.4.6.1.								

Table II- 4. Scoring and Weighting
Index 2. PROGRESS

STATE:

REGION:

Measure	Sub-Indicator Value Score Wt. Wtd. Score	Indicator Value Score Wt. Wtd. Score	Sub-Index Score Wt. Wtd. Score	Index Score
2.1.1.1.				
2.1.1.2.				
2.1.1.3.				
2.1.1.4.				
2.1.1.5.				
2.1.1.6.				
2.1.1.7.				
2.1.1.8.				
2.1.1.				
2.1.Meeting Com.				
2.2.1.				
2.2.2.				
2.2. Source Compl.				
2.3.1.				
2.3.2.				
2.3.3.				
2.3.4.1.				
2.3.4.2.				
2.3.4.3.				
2.3.4.				
2.3.Surv. & Enf.				
2.4.1.1.				
2.4.1.2.				
2.4.1.3.				
2.4.1.TSP				
2.4.2.1.				
2.4.2.2.				
2.4.2.3.				
2.4.2.SO_2				
2.4.3.1.				
2.4.3.2.				
2.4.3.3.				
2.4.3.CO				
2.4.4.1.				
2.4.4.2.				
2.4.4.3.				
2.4.4.O_x				
2.4.5.1.				
2.4.5.2.				
2.4.5.3.				
2.4.5.NO_2				
2.4.6.1.				
2.4.6.Em.				
2.4.Monitoring				
2.PROGRESS				

The ranges of values to be used are listed on Table II-3, as are the scales and scoring intervals. The computed indicator values are converted to scores and weighted on Table II-4, and weighted indicator scores are summed to yield the score for sub-index 2.2.

(3) Sub-Index 2.3. Surveillance and Enforcement Actions

The numbers of field surveillance and enforcement actions and the number of non-complying sources are taken from the State Activity Report; the total number of sources is taken from a printout or summary list of the number of manufacturing facilities in each state derived from the Dun & Bradstreet DMI file, to which EPA subscribes. Indicators 2.3.1., 2.3.2., 2.3.3., and sub-indicators 2.3.4.1., 2.3.4.2., and 2.3.4.3. are computed on worksheet #4.

The ranges of computed values for indicators 2.3.1. and 2.3.2., and sub-indicators 2.3.4.1., 2.3.4.2., and 2.3.4.3. are listed on Table II-3. Computed values of indicator 2.3.3., percentage of field surveillance actions taken by the state, do not exceed 100%, so a range of 0 to 100% is used and listed on Table II-3. Scales and scoring intervals are determined.

Computed values of the sub-indicators are converted to scores, weighted and summed to obtain a score for indicator 2.3.4. on Table II-4. Computed values for indicators 2.3.1., 2.3.2., and 2.3.3. are converted to scores and weighted and then combined with the weighted score for indicator 2.3.4. to obtain the sub-index score.

(4) Sub-Index 2.4. Monitoring and Reporting Air Quality and Emissions

The first five indicators under sub-index 2.4. measure monitoring for the five criteria pollutants, and each is composed of 3 sub-indicators: (a) AQCR average percent of needed stations added, (b) percent of needed AQCRs with complete network added, and (c) SAROAD sufficiency score.

(a) The percentage of stations needed in the previous period to complete the federally required network, that was added in the present period, is computed for each state using worksheet #5a and detailed instructions in the Workbook. Only stations that do not use unacceptable pollutant-methods and that reported at least one quarter per year of sufficient data to SAROAD are counted. If no stations are needed in all AQCRs in a state, no value for the sub-indicator is computed for the state.

Negative values, resulting from fewer stations reporting in the present period than the previous period, are possible. Data are drawn from the published Monitoring and Trends Report or if more recent data are needed, from SAROAD printouts.

A top limit is set on this sub-indicator (see discussion on p. II-18) so that values can range from a negative number to 100% (100% means that all needed stations were added). Therefore the range of values used listed on Table II-3 for each sub-indicator is the lowest computed value (or 0 if there are no negative values) to 100%, and the value ranges for the scoring intervals are determined. The computed value is converted to a score for each state and each sub-indicator, and listed on Table II-4.

(b) The percentage of AQCRs in a state with less than a complete network for each pollutant in the previous period that attained a complete network in the present period is also computed for each state using worksheet #5a and detailed instructions in the Workbook. If there are no AQCRs in a state that have less than a complete network in the previous period, no value for the sub-indicator is computed for the state. A larger number of AQCRs with less than a complete network in the present period than in the previous period would result in a negative computed value.

Data are drawn from the Monitoring and Trends Report or SAROAD printouts for more recent data.

The highest value that can be computed is 100% since it is not possible that more than all of the AQCRs that needed stations achieved complete networks. Thus on Table II-3 the range of values used for each sub-indicator is the lowest computed value (or 0 is there are no negative values) to 100%. Ranges for values for each scoring interval are also listed. The computed value for each sub-indicator and each state is converted to a score on Table II-4.

(c) The SAROAD sufficiency score for the present period, which is the percentage of station-quarters of data sent to SAROAD during the present period that met sufficiency criteria (see p. II-20 for discussion of sufficiency criteria), is computed on worksheet #5b. Data are from the AEROS Status Report or from a SAROAD printout.

The range of possible values is 0 to 100% and is listed on Table II-3. Ranges for scoring intervals are determined using the selected scale and listed on Table II-3. On Table II-4 the computed value for each sub-indicator and each state is converted to a score.

Once the scores for all three sub-indicators under each pollutant indicator are computed, the sub-indicator scores are weighted and summed on Table II-4 to yield the indicator score for each state.

The last indicator, 2.4.5. Emissions Reporting, is made up of one sub-indicator, 2.4.5.1. percent of missing NEDS necessary data items completed during the period. The values for this sub-indicator are computed for all states using worksheet #6 in the Workbook. Data are from the AEROS Status Report or NEDS printout of the Missing Data Items Report.

Possible values for the sub-indicator range from a negative number (when more items were missing in the present period than the previous period) to a maximum of 100% (at best all missing data were completed and no new items were missing). The lowest computed value and 100% (or the highest computed value if all state values are much less than 100%) are listed on Table II-3 as the lowest and highest values of the range of values used. Ranges of the scoring intervals are also listed on Table II-3.

The sub-indicator value for each state is listed on Table II-4 and converted to a score. Because there is only 1 sub-indicator for the indicator, the score for indicator 2.4.5. for each state is the same as the sub-indicator score.

Once all six indicator scores have been determined, the indicator scores for each state are weighted and summed for the score for sub-index 2.4.

Once scores for all four sub-indices under index 2 have been determined, the sub-index scores are weighted and summed on Table II-4 to obtain the score for index 2.

c. Index 3. ACHIEVEMENT (see flowchart, Figure II-5, p. II-21)

(1) Sub-Index 3.1. Source Compliance

Indicators 3.1.1. percent of sources in compliance and 3.1.2. percent of non-complying sources on compliance schedules are computed using worksheet #4 in the Workbook. Data are taken from the State Activity Report.

Computed values can range from 0 to 100%, and this range of all values and the ranges of values for scoring intervals are listed on Table II-5. Using these scoring interval ranges, computed values for each state are converted to scores on Table II-6. Indicator scores are weighted and summed to obtain the score for sub-index 3.1. for each state.

(2) Sub-Index 3.2. Monitoring and Reporting Air Quality and Emissions

The first five indicators deal with monitoring and reporting of AAQ of the five criteria pollutants. Each pollutant-indicator

Table II-5. Converting Values to Scores
Index 3. ACHIEVEMENT

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
Source Compliance								
Indicators:								
3.1.1.								
3.1.2.								
Monitoring & Reporting								
% of Required stations								
Sub-Indicators:								
3.2.1.1.								
3.2.2.1.								
3.2.3.1.								
3.2.4.1.								
3.2.5.1.								
% of AQCRs								
Sub-Indicators:								
3.2.1.2.								
3.2.2.2.								
3.2.3.2.								
3.2.4.2.								
3.2.5.2.								
Pollutant-Methods								
Sub-Indicators:								
3.2.1.3.								
3.2.2.3.								
3.2.3.3.								
3.2.4.3.								
3.2.5.3.								
Emissions Rptg.								
Sub-Indicators:								
3.2.6.1.								
3.2.6.2.								
Completing Plans								
Indicator:								
3.3.1.								

Table II-6 . Scoring and Weighting
Index 3. ACHIEVEMENT

STATE:

REGION:

Measure	Sub-Indicator Value Score Wt. Wtd. Score	Indicator Value Score Wt. Wtd. Score	Sub-Index Score Wt. Wtd. Score	Index Score
3.1.1.				
3.1.2.				
3.1.Source Compl.				
3.2.1.1.				
3.2.1.2.				
3.2.1.3.				
3.2.1.TSP				
3.2.2.1.				
3.2.2.2.				
3.2.2.3.				
3.2.2.SO_2				
3.2.3.1.				
3.2.3.2.				
3.2.3.3.				
3.2.3.CO				
3.2.4.1.				
3.2.4.2.				
3.2.4.3.				
3.2.4.O_x				
3.2.5.1.				
3.2.5.2.				
3.2.5.3.				
3.2.5.NO_2				
3.2.6.1.				
3.2.6.2.				
3.2.6.				
3.2.Monitoring				
3.3.1.				
3.3.Completing Plans				
3.ACHIEVEMENT				

is composed of 3 sub-indicators: (a) AQCR average percent of required network, (b) percent of AQCRs with required network, and (c) percent of pollutant-methods used that are not unacceptable. All data for these pollutant indicators are drawn from the Monitoring and Trends Report, Air Quality Data-Annual Statistics, or from SAROAD printouts for more recent data.

(a) The percentage of the federally required network reporting at least 1 quarter per year of sufficient data to SAROAD in the present period, averaged over all AQCRs in a state, is computed using worksheet #5a in the Workbook.

There is a top limit of 100% on the computed value of this sub-indicator for a state (see discussion on p. II-18), so that the range of all possible values is 0 to 100% (100% means that all AQCRs in a state have the federal minimum required number of stations). For an AQCR that is not required to have any stations for a given pollutant, a value of 100% is given to that AQCR, regardless of the number of stations actually reporting to SAROAD.

The 0 to 100% range of possible values, and the ranges of the scoring intervals are listed on Table II-5. The computed value for each sub-indicator for each state is converted to a score on Table II-6.

(b) The percentage of AQCRs in a state with the federal minimum required network reporting to SAROAD in the present period is also computed on worksheet #5a.

The range of all possible values, which is 0 to 100% in this case, is listed on Table II-5, and the ranges of values of the scoring intervals are determined. Again, an AQCR that is not required to have any stations is considered to have the minimum required network regardless of the number of stations actually reporting. Each computed value for each state is converted to a score on Table II-6.

(c) The percentage of stations reporting data to SAROAD using pollutant-methods that are not unacceptable ("not unacceptable" is discussed on p.II-25) is computed using worksheet #5a.

For TSP, no unacceptable methods were reported to SAROAD in 1972 and 1973 because of the prevalent use of the federal reference method. Until this situation changes, this sub-indicator for TSP (3.2.1.3.) should probably be given a weight of 0. There were relatively few unacceptable methods for SO_2 and CO reported to SAROAD in 1972 and 1973, and these numbers may decrease in succeeding years; accordingly the sub-indicators for CO (3.2.3.3.) and SO_2 (3.2.2.3.) can be given low weights.

The range of possible values is 0 to 100%. This range and the ranges of values for the scoring intervals are listed on Table II-5. Each computed sub-indicator value for each state is converted to a score on Table II-6.

Once the sub-indicator scores for each pollutant indicator are determined, the indicator score is obtained by weighting and summing the component sub-indicator scores.

The last indicator under sub-index 3.2. is 3.2.6. Emission Reporting, which consists of 2 sub-indicators. Sub-indicator 3.2.6.1. percent of total possible sources on NEDS, is computed on worksheet #6, using data on the NEDS verification file. Using the NEDS Missing Data Report in the AEROS Status Report or more recent NEDS printouts, values for sub-indicator 3.2.6.2. percent of necessary NEDS data items that are missing, are also computed on worksheet #6 in the Workbook.

Possible values for sub-indicator 3.2.6.1. range from 0 (which is improbable since it implies no sources on NEDS) to 100%. On Table II-5 this range and the ranges of values for the scoring intervals are listed. Computed values are then converted to scores on Table II-6.

It should be noted that for sub-indicator 3.2.6.2., a low value means relatively few items missing and a high value means a large proportion of items missing. In contrast to most other measures, the higher the value, the lower the extent of achievement. Therefore the range of values used for scoring goes from the highest to the lowest sub-indicator values.

Also regarding sub-indicator 3.2.6.2., a minimum number of the necessary data items is required in order to get a source into NEDS. Therefore, the largest possible value for 3.2.6.2. is the percent of necessary NEDS data items that are missing when all the possible # of data items that could be missing, without the point source being rejected by NEDS, are actually missing. For a given state, this is equal to:

$$1 - \frac{\left(\begin{array}{c}\text{Minimum \# of necessary}\\ \text{data items required}\end{array}\right)}{\left(\begin{array}{c}\text{Total \# of necessary data items}\\ \text{for all sources in the state}\end{array}\right)}$$

The upper limit of the range of possible values is 0 (no data items missing). The range of possible values and the ranges of scoring intervals are listed on Table II-5. For each state the computed sub-indicator score is converted to a score on Table II-6.

The scores for sub-indicators 3.2.6.1. and 3.2.6.2. for each state are weighted and summed on Table II-6 to yield a score for indicator 3.2.6.

After all scores for indicators 3.2.1. to 3.2.6. for each state are calculated, the score for sub-index 3.2. is calculated on Table II-6 by weighting and summing the indicator scores.

(3) Sub-Index 3.3. Completing Plans and Revisions

Using data from the SIP Progress Report covering the 6-month period at the end of the present period of evaluation (e.g., June-December 1973 report for calendar year 1973), the value for the only indicator under sub-index 3.3. is computed. The indicator 3.3.1., percent of required SIP portions completed, uses the categorization of SIP portions used in the SIP Progress Report, and is equal to:

$$1 - \frac{\left(\begin{array}{c}\text{\# of SIP portions found by EPA}\\ \text{to be deficient, including those}\\ \text{proposed or promulgated by EPA}\end{array}\right)}{\left(\begin{array}{c}\text{Total possible \# of SIP portions}\\ \text{required by the end of the present period}\end{array}\right)}$$

The total possible # is equal to the number of SIP portions outlined in the SIP Progress Report times the number of AQCRs in the state. An SIP portion of a statewide plan found by EPA to be deficient is considered to be deficient for all AQCRs in the state and thus the number of deficient portions is equal to the number of AQCRs. Worksheet #7 in the Workbook is used to calculate indicator values.

The range of possible values for the indicator are 0 (improbable because no state has had all of the possible number of SIP portions declared deficient) to 100% (no deficiencies). This range and the ranges of the scoring intervals are entered on Table II-5, and the indicator value for each state is converted to a score on Table II-6. Because this is the only indicator under sub-index 3.3., the sub-index score is the same as the indicator score.

After all sub-index scores (3.1., 3.2., 3.3.) are calculated for a state, the scores are weighted and summed to obtain the score for index 3.

2. Need Indices

a. Index 4. PROBLEM (see flowchart, Figure II-6, p. II-29)

(1) Sub-Index 4.1. Ambient Air Quality (AAQ) Problem

Each indicator measures the AAQ problem for one of the five criteria pollutants, and is composed of two types of sub-indicators: (a) air quality deviation indication (AQDI) and (b) population exposed to air quality worse than standards.

(a) The air quality deviation indication sub-indicator for a given pollutant and a given primary pollutant standard is equal to:

$$\sum^{AQCR} \sum^{VES} \frac{(\text{Pollutant value}) - (\text{Pollutant standard})}{\text{Pollutant standard}}$$

where $\sum^{VES}$ = sum over all values in an AQCR with a pollutant value exceeding the standard

and $\sum^{AQCR}$ = sum over all AQCRs in a state.

The AQDI can be corrected to account for the completeness of a state's monitoring network. The corrected AQDI for a given pollutant and a given primary pollutant standard is equal to:

$$\sum^{AQCR} \frac{\sum^{VES} \frac{(\text{Pollutant value}) - (\text{Pollutant standard})}{\text{Pollutant standard}}}{\frac{\text{No. of stations reporting pollutant value}}{\text{Minimum required no. of stations}}}$$

The values for both the uncorrected and corrected AQDI can be computed using worksheet #8 and instructions in the Workbook. Data are drawn from the Monitoring and Trends Report for annual means and SAROAD printouts for other values and also for more recent data for all values.

The possible values for the AQDI, both uncorrected and corrected, range from 0 to any positive number. The range of computed values for all states being analyzed, as well as ranges of scoring intervals are listed on Table II-7. Computed values for each state are then converted to scores on Table II-8.

(b) The exposed population sub-indicator for each pollutant and pollutant standard is the population in those AQCRs

Table II-7. Converting Values to Scores
Index 4. PROBLEM

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
AAQ Problem								
AODI								
Sub-Indicators:								
4.1.1.1.(a)TSP								
4.1.1.1.(b)TSP								
4.1.1.2.(a)TSP								
4.1.1.2.(b)TSP								
4.1.2.1.(a)SO_2								
4.1.2.1.(b)SO_2								
4.1.2.2.(a)SO_2								
4.1.2.2.(b)SO_2								
4.1.3.1.(a)CO								
4.1.3.1.(b)CO								
4.1.3.2.(a)CO								
4.1.3.2.(b)CO								
4.1.4.1.(a)O_x								
4.1.4.1.(b)O_x								
4.1.5.1.(a)NO_2								
4.1.5.1.(b)NO_2								
Population (1000)								
Sub-Indicators:								
4.1.1.3. TSP								
4.1.1.4.								
4.1.2.3. SO_2								
4.1.2.4.								
4.1.3.3. CO								
4.1.3.4.								
4.1.4.2. O_x								
4.1.5.2. NO_2								
Emissions & Em. Sources								
Indicators:								
4.2.1. Pop.								
4.2.2. Land								
4.2.3. Pop.Gr.								
4.2.4. Manu.Gr.								
Emissions (1000T/yr)								
Sub-Indicators:								
4.2.5.1. TSP								
4.2.5.2. SO_2								
4.2.5.3. CO								
4.2.5.4. HC								
4.2.5.5. NO_x								
Emission Reduction Needed								
Indicators:								
4.3.1. TSP								
4.3.2. SO_2								
4.3.3. CO								
4.3.4. HC								
4.3.5. NO_x								

(a) = Corrected
(b) = Uncorrected

Table II- 8. Scoring and Weighting
Index 4. PROBLEM

STATE:

REGION:

Measure	Sub-Indicator Value Score Wt. Wtd. Score	Indicator Value Score Wt. Wtd. Score	Sub-Index Score Wt. Wtd. Score	Index Score
4.1.1.1.				
4.1.1.2.				
4.1.1.3.				
4.1.1.4.				
4.1.1.TSP				
4.1.2.1.				
4.1.2.2.				
4.1.2.3.				
4.1.2.4.				
4.1.2.SO_2				
4.1.3.1.				
4.1.3.2.				
4.1.3.3.				
4.1.3.4.				
4.1.3.CO				
4.1.4.1.				
4.1.4.2.				
4.1.4.O_x				
4.1.5.1.				
4.1.5.2.				
4.1.5.NO_2				
4.1.AAQ Problem				
4.2.1.				
4.2.2.				
4.2.3.				
4.2.4.				
4.2.5.1.				
4.2.5.2.				
4.2.5.3.				
4.2.5.4.				
4.2.5.5.				
4.2.5.				
4.2.Em & Em. Sources				
4.3.1.				
4.3.2.				
4.3.3.				
4.3.4.				
4.3.5.				
4.3.Em. Reduc. Needed				
4.PROBLEM				

(and state portions of interstate AQCRs) for which a positive AQDI is computed. The sub-indicators are computed using worksheet #9 and instructions in the Workbook. Data is taken from census population figures as presented in the OBERS extension to AQCRs (see Appendix II-A for description). State portions of interstate AQCRs are derived from an NADB printout of the population of state-AQCR combinations.

The range of computed values for each exposed population sub-indicator is listed on Table II-7, and the ranges of the scoring intervals are determined. Computed values are converted into scores on Table II-8.

Scores for the AQDI and population exposed sub-indicators for each pollutant indicator are weighted and summed to calculate scores for each pollutant indicator.

Indicator scores for each pollutant are then weighted and summed to calculate a score for sub-index 4.1. for each state.

(2) Sub-Index 4.2. Emissions and Emission Sources

Values for the urbanized area population indicator (4.2.1.) are taken from the census or any of the statistical abstracts based on the decennial census. The Census Bureau also publishes annual population estimates so that more current population figures are available. Urbanized (SMSA) land area values (indicator 4.2.2.) are from the Statistical Abstract of the U.S.

Values for the projected population (1970-1980) and manufacturing (1969-1980) growth rate indicators (4.2.3. and 4.2.4.)

are from the OBERS projections. An alternative source of population growth rates is the Census Bureau Series C or Series E estimates (which served as a basis for the OBERS rates). The OBERS projections of changes from 1969 to 1980 in a production index for all manufacturing industries are used to calculate manufacturing growth rate. The index is considered an estimate of gross product. Alternatively, OBERS projections of total earnings for manufacturing industries, which are not adjusted to account for differential gross product-earnings ratios among industries as are the production indexes, can be used to calculate rates of growth of manufacturing activity.

The ranges of computed values for these indicators, computed using worksheet #10 in the Workbook are listed on Table II-7, as are the ranges for the scoring intervals. Values for each state are converted to scores on Table II-8.

The last indicator, 4.2.5. Total Emissions, is composed of five sub-indicators, one for each criteria pollutant emitted. Total emissions from all point and area sources in a state are taken from the National Emissions Report or from NEDS printouts for more recent data, and are listed on worksheet #2. The ranges of values for each sub-indicator for all states are listed on Table II-7, followed by ranges of scoring intervals. Scores for the computed values of the five sub-indicators for each state are listed on Table II-8, weighted and summed for the score for indicator 4.2.5.

Indicator scores are weighted and summed to yield the score for index 4.2.

(3) Sub-Index 4.3. Emission Reduction Needed

There are five indicators, one for each criteria pollutant emitted. Each indicator is equal to:

(Emission Goal) - (Emissions for Present Period)

and is computed on worksheet #2 in the Workbook.

Emissions for the present period are obtained from the National Emissions Report covering the present period and are the total emissions of a pollutant from all point and area sources in a state. The emission goals for each pollutant for each state are projected to be available from the NADB's SIP automated information system in the near future.

The ranges of values for the five pollutant indicators are listed on Table II-7, as well as the ranges for each scoring interval for each pollutant. Individual state values are converted to scores on Table II-8 and scores for the five indicators are weighted and summed to calculate the score for sub-index 4.3.

b. Index 5. OPERATIONAL REQUIREMENTS (see flowchart, Figure II-7, p. II-35)

(1) Sub-Index 5.1. Source Compliance and Enforcement

The four source compliance and enforcement indicators are computed on worksheet #4 in the Workbook. Data are derived from the State Activity Report and the Dun and Bradstreet DMI file.

Ranges of computed values for all states and ranges of the scoring intervals for each indicator are listed on Table II-9, values for each state are converted to scores on Table II-10

Table II-9. Converting Values to Scores
Index 5. OPERATIONAL REQUIREMENTS

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
Source Compliance & Enforcement								
Indicators:								
5.1.1.								
5.1.2.								
5.1.3.								
5.1.4.								
Monitoring & Reporting								
No. of Needed Stations								
Sub-Indicators:								
5.2.1.1.								
5.2.2.1.								
5.2.3.1.								
5.2.4.1.								
5.2.5.1.								
No. of AQCRs								
Sub-Indicators:								
5.2.1.2.								
5.2.2.2.								
5.2.3.2.								
5.2.4.2.								
5.2.5.2.								
Improvement in SAROAD score								
Sub-Indicators:								
5.2.1.3.								
5.2.2.3.								
5.2.3.3.								
5.2.4.3.								
5.2.5.3.								
Emissions Rptg.								
Sub-Indicators:								
5.2.6.1.								
5.2.6.2.								
Completing Plans								
Indicator:								
5.3.1.								

Table II-10. Scoring and Weighting
Index 5. OPERATIONAL REQUIREMENTS

STATE:

REGION:

Measure	Sub-Indicator				Indicator				Sub-Index			Index
	Value	Score	Wt.	Wtd. Score	Value	Score	Wt.	Wtd. Score	Score	Wt.	Wtd. Score	Score
5.1.1.												
5.1.2.												
5.1.3.												
5.1.4.												
5.1.Source Compl.												
5.2.1.1.												
5.2.1.2.												
5.2.1.3.												
5.2.1.TSP												
5.2.2.1.												
5.2.2.2.												
5.2.2.3.												
5.2.2.SO_2												
5.2.3.1.												
5.2.3.2.												
5.2.3.3.												
5.2.3.CO												
5.2.4.1.												
5.2.4.2.												
5.2.4.3.												
5.2.4.O_x												
5.2.5.1.												
5.2.5.2.												
5.2.5.3.												
5.2.5.NO_2												
5.2.6.1.												
5.2.6.2.												
5.2.6.Em.												
5.2.Monitoring												
5.3.1.												
5.3.Completing Plans												
5.OPERATIONAL REQUIREMENTS												

and scores are weighted and summed to obtain the score for sub-index 5.1. for each state.

(2) Sub-Index 5.2. Monitoring and Reporting Air Quality and Emissions

The first five indicators are for monitoring ambient air quality levels of the five criteria pollutants. Each pollutant indicator is composed of three sub-indicators: (a) number of stations that need to be added, (b) number of AQCRs with less than the required network, and (c) improvement in SAROAD sufficiency score needed.

(a) The number of stations for each pollutant that need to be added in a state at the end of the present period is equal to:

$$\sum^{\text{AQCR}} \left[\begin{pmatrix} \text{Minimum required \#} \\ \text{of stations} \end{pmatrix} - \begin{pmatrix} \text{\# of stations that} \\ \text{reported data during} \\ \text{the present period} \end{pmatrix} \right] \geq 0 \text{ in each AQCR}$$

where $\sum^{\text{AQCR}}$ = sum over all AQCRs in the state.

Only stations that do not use unacceptable pollutant-methods (see Appendix II-B) and that reported at least one quarter per year of sufficient data to SAROAD are counted. Only AQCRs that needed stations to complete the federally required network are counted; no negative values are included in the state total. Worksheet #5a in the Workbook is used to compute the values for the sub-indicators.

Data are taken from the Monitoring and Trends Report or SAROAD printout covering the present period.

Possible values for each pollutant range from 0 (no stations required in any AQCR in a state) to the total number of minimum required stations in a state. The range of values listed on Table II-9 is 0 to the largest number computed for a state. Ranges for the scoring intervals are also listed on Table II-9. Computed values for each state are converted to scores on Table II-10.

(b) The number of AQCRs in a state with less than the federally required network for each pollutant is taken from the Monitoring and Trends Report or SAROAD printout covering the present period, and is entered on worksheet #5a. Only stations that do not use unacceptable pollutant-methods and that reported at least one quarter per year of sufficient data to SAROAD are counted toward the minimum required number of stations.

Possible values range from 0 (all AQCRs have the minimum required number of stations reporting to SAROAD) to the total # of AQCRs in a state. On Table II-9, a range of 0 to the largest computed state value, and the ranges of the scoring intervals are listed. Scores are calculated on Table II-9 by converting computed state values for the pollutants.

(c) Improvement needed in the SAROAD sufficiency score for each pollutant and each state is equal to:

(100) - (Sufficiency score for present period).

The sufficiency score for the present period was computed for index 2, and the improvement needed is calculated on worksheet #5b in the Workbook. Data are from the AEROS Status Report or from a SAROAD printout.

Possible scores range from 0 to 100 and the range of all possible scores and ranges for the scoring intervals are listed on Table II-9. The values for the sub-indicators for the various pollutants for each state are converted to scores on Table II-10.

When all three sub-indicator scores for each pollutant are determined, the scores are weighted and summed on Table II-10 for the score for each of the pollutant indicators (5.2.1. to 5.2.5.).

The last indicator, 5.2.6. Emissions Reporting, has two component sub-indicators. Sub-indicator 5.2.6.1. counts the number of sources that are on the NEDS verification file and thus may need to be added to NEDS. Sub-indicator 5.2.6.2. counts the number of necessary NEDS data items that are missing and need to be completed. Values for both sub-indicators are entered on worksheet #6 in the Workbook. Sources for the data are the NEDS list of sources on the verification file by state, and the NEDS Missing Data Items Report (in the AEROS Status Report).

The scores for all six indicators for each state are weighted and summed on Table II-10 to calculate the score for sub-index 5.2.

(3) Sub-Index 5.3. Completing Plans and Revisions

Indicator 5.3.1. counts the number of SIP portions which require state action, completion, or adoption. This is assumed to be equal to the number of portions of statewide or area plans declared deficient by EPA, including non-regulatory portions that require state submittal, regulatory portions proposed or promulgated by EPA in the absence of approved state action, and deficiencies in legal authority. The source of data is the SIP Progress Report covering the end of the present period. Worksheet #7 is used to enter the value of this indicator.

The range of computed values for all states is listed on Table II-9, and the ranges of values for the scoring intervals is determined. The computed value for each state is converted to a score on Table II-10. Because this is the only component indicator under this sub-index, the indicator score is the same as the score for sub-index 5.3.

Scores for each state calculated for the three sub-indices are weighted and summed on Table II-10, and the score for index 5 is entered.

C. Trial Run

A trial run of the system using existing data for all 55 states and territories was conducted to serve four purposes:

(1) To test the availability and accessibility of data for all states and territories;

(2) To bring out any problems involved in using the data and calculating values and scores;

(3) To provide actual values and scores on the basis of which some assessment of the validity of the measures can be made;

(4) To provide an estimate of the amount of time and effort involved in implementing the system.

Data availability was a problem throughout the trial run for three reasons:

(a) Data banks in the Research Triangle Park, N.C., are currently being converted to the UNIVAC 1110 computer. Consequently there have been some problems having programs run and output produced; e.g. short-term ambient air quality values from SAROAD could not be obtained. Because these difficulties are considered to be temporary, no measures or procedures described in sections B and C were changed for this reason. To complete the trial run in spite of these difficulties substitute values were used for certain measures, and certain other measures were not computed.

(b) Infrequently, no data for a particular parameter was available for an individual state either because of nonsubmission of data by a state or because of a programming error. For example, NEDS

1973 emissions for Nebraska were missing from the printout and lack of time prevented going back and getting them.

(c) Some data not currently available at EPA headquarters were included, nevertheless, in constructing the measures because they are expected to be available in the near future. The most prominent example is the state emissions goals necessary to compute emissions reductions needed, which are expected to be incorporated in the SIP automated information system. Another example is NO_2 monitoring and ambient air quality data; although this data was not used in the trial run because of the uncertainty of measurement methods, the situation can be expected to be clarified in the near future. For those measures dependent on these data, either substitute values or measures were used instead, or the measures were not computed.

When data were not available and substitutes were used, this is explained fully for each measure affected. Where values for measures were not computed at all, this is explained in the discussion of the measure and noted in the formatted results, and weights of 0 were assigned to these measures before scores were aggregated.

Based on the trial run of the system, it is estimated that once the data are available, computation of index scores and presentation of the results in the suggested formats for the fifty-five states and territories takes approximately 38 person-days. Using the instruction in section B and the Workbook (Appendix II-E), only very basic mathematical skills are required. Collecting and computing the state background information takes another three person-days; some of the information (such as land data) does not have to be collected a second time.

A breakdown by index of the time that was required in the trial run is presented below:

Index 1: 10 person-days
Index 2: 10.25 person-days
Index 3: 4.75 person-days
Index 4: 9.75 person-days
Index 5: 3.25 person-days
State Background Information: 3 person-days

It would appear that annual application of the system on a manual basis is feasible in terms of time and effort required. The length of time could be shortened significantly by automating computation of the AQDI and AAQI measures as suggested in Section E of this report. On the other hand, computation of the short-term AQDI and AAQI measures, which was not done in the trial run because of unavailability of data, would add considerably more time unless the computation procedures were computerized.

For the trial run, a weighting system developed partly on the basis of the results of a questionnaire sent to the Regional Offices was used. The weight for each component measure is given on the appropriate table before the component scores are weighted and summed to calculate scores on the next level of aggregation. Four scoring intervals, representing quartiles, with scores of 1, 2, 3, and 4 (the larger the score, the greater the performance or need) were chosen.

The rest of this section is devoted to discussion of each of the measures, according to the outline of indices used in Sections A and B. For each measure, the following points are discussed:

(1) Data sources used;

(2) Time periods to which the measures are relevant for the trial run;

(3) Calculation procedures used in the trial run insofar as they differed from those set forth in Section B;

(4) Any difficulties with definitions of terms or computation of values or scores encountered;

(5) Actual values and scores computed on the tables described in Section B.

1. Performance Indices

a. Index 1. GOAL ATTAINMENT

(1) Ambient Air Quality Improvement (AAQI)

Data for short-term values could not be obtained from SAROAD because of computer difficulties. Therefore the AAQI sub-indicators for the TSP and SO_2 24-hour standards and the CO 1-hour standards were not computed (no NO_2 values were used).

Because many states did not have sufficient data to compute annual means for TSP and SO_2, it was decided to substitute the 50th percentile value of the frequency distribution of all values reported to SAROAD for the TSP annual geometric mean, and the 70th percentile value for the SO_2 annual arithmetic mean. Such substitutions are recognized to be rough estimations at best, and it is expected that the sufficiency of data reported to SAROAD will improve, enabling the use of annual means in the near future.

The 50th and 70th percentile values for TSP and SO_2 were taken from the 1972 and 1973 Air Quality Data-Annual Statistics. Stations with less than 15 observations (an arbitrary number equivalent to a minimum of 5 values per quarter for a minimum of 3 quarters per year, although no assessment of the distribution of values within a quarter was made) were eliminated. For the remaining stations, station code numbers reporting in 1972 and 1973 were matched to obtain a set of stations that reported data in both years.

Using these stations, the sums of all percent deviations above the annual TSP and SO_2 standards (I) for 1972 and 1973 were computed:

$$\sum^{AQCR}\sum^{SES}\frac{\begin{pmatrix}\text{TSP 50th or SO}_2\\ \text{70th \% value}\end{pmatrix} - \begin{pmatrix}\text{TSP or SO}_2\text{ primary}\\ \text{annual standard}\end{pmatrix}}{(\text{TSP or SO}_2\text{ primary annual standard})}$$

where $\sum^{SES}$ = sum over all stations with TSP 50th or SO_2 70th % value exceeding standard

and $\sum^{AQCR}$ = sum over all AQCRs in a state.

Because short-term values were not available, substitutes were used for the CO 8-hour and O_x 1-hour AAQI sub-indicators. From the 1972 and 1973 Monitoring and Trends Report, stations that reported CO and O_x data in both years were identified. For these stations air quality deviation for the state in each year was computed. For O_x, AQ deviation (I) was equal to:

$$\sum^{AQCR}\sum^{SES}\left[\frac{\begin{pmatrix}\text{\# 1-hr. values}\\ \text{exceeding std.}\end{pmatrix}\times 100}{\text{total \# valid 1-hr. values}}\right]\left[\frac{\begin{pmatrix}\text{2nd highest}\\ \text{1-hr. value}\end{pmatrix} - (\text{Std.})}{\text{Std.}}\right]$$

where $\sum^{SES}$ = sum over all stations in an AQCR with 2 or more valid values exceeding the standard

and $\sum^{AQCR}$ = sum over all AQCRs in a state.

(Note: The number of values above the standard is multiplied by 100 only to avoid numbers with a large number of decimal places.)

The air quality deviation (I) for the CO 8-hour standard was computed in the same way except that, because the second highest 8-hour average is not yet printed in the Monitoring and Trends Report, the highest 8-hour average was used. Thus (I) for CO was equal to:

$$\sum^{\text{AQCR}} \sum^{\text{SES}} \left[\frac{\left(\begin{array}{c} \text{\# 8-hr. averages} \\ \text{exceeding std.} \end{array} \right) \text{X } 100}{\left(\begin{array}{c} \text{total \# valid 8-hr.} \\ \text{averages} \end{array} \right)} \right] \left[\frac{(\text{highest 8-hr. average}) - (\text{Std.})}{\text{Std.}} \right]$$

where $\sum^{\text{SES}}$ = sum over all stations in an AQCR with 2 or more valid values exceeding the standard,

and $\sum^{\text{AQCR}}$ = sum over all AQCRs in a state.

For each pollutant, if the air quality deviation (I) for each state was greater than 0 (indicating values greater than standards) for both 1972 and 1973, the difference between the numbers for the 2 years was computed to yield the percent improvement in air quality deviation:

$$\frac{1972(\text{I}) - 1973(\text{I})}{1972} \times 100 \left[\begin{array}{l} 1.1.1.1.(\text{a})\text{TSP} \\ 1.2.1.1.(\text{a})\text{SO}_2 \\ 1.3.1.1.(\text{a})\text{CO} \\ 1.4.1.1.(\text{a})\text{O}_x \end{array} \right]$$

If (I) for a state was 0 or less for either 1972 or 1973, the sums of all observed values (H) for both years were computed and the percent improvement in air quality was calculated:

$$\frac{1972(\text{H}) - 1973(\text{H})}{1972(\text{H})} \times 100 \left[\begin{array}{l} 1.1.1.1.(\text{b})\text{TSP} \\ 1.2.1.1.(\text{b})\text{SO}_2 \\ 1.3.1.1.(\text{b})\text{CO} \\ 1.4.1.1.(\text{b})\text{O}_x \end{array} \right]$$

The values thus computed represent air quality improvement from 1972 to 1973.

(2) Emission Reduction

Emission goals for each state (emission levels needed to attain AAQS) were not available, although they are projected to be available in the near future from the SIP automated information system. For the trial run, percentage emission reductions were computed and used as the values for the emission reduction sub-indicators.

Total 1972 and 1973 emissions from all point and area sources in a state were taken from the 1972 National Emissions Report and a NEDS printout emission summary by state dated January 1975 that is generally representative of 1973 emissions. For each pollutant, emission reduction from 1972 to 1973 was computed:

$$\frac{\text{1972 emissions} - \text{1973 emissions}}{\text{1972 emissions}} \times 100 \begin{bmatrix} 1.1.1.2.\text{TSP} \\ 1.2.1.2.\text{SO}_2 \\ 1.3.1.2.\text{CO} \\ 1.4.1.2.\text{HC} \\ 1.5.1.2.\text{NO}_2 \end{bmatrix}$$

(3) PRMS Flags

Those stations in the PRMS Analytical Summary Report (Analysis No. 3, October 1974) which had a quarter in calendar year 1973 as the last quarter for which data was available, were identified. Of these stations, the number with a potential deficiency in either magnitude or frequency flagged for each pollutant-standard in the state was counted. The number of sites in each AQCR with sufficient data for analysis for each pollutant was also calculated. It should be noted that the number of sites flagged is counted for each pollutant-standard analyzed; TSP, SO_2, and CO each had two standards for which the analysis was done, while O_x had one.

For each sub-indicator, the range of values and scoring intervals for all states, and computed values, scores and weights for all measures under index 1 for a sample state are shown on Tables II-11 and II-12, as instructed in Section B.

b. Index 2. PROGRESS

(1) Sub-Index 2.1. Meeting MBO Commitments

MBO commitments and outputs for the second quarter of FY75 were taken from the State Activity Report for the period ending December 31, 1974. Calculation of sub-indicator values was done as instructed in Section B.

(2) Sub-Index 2.2. Source Compliance

Data was drawn from the State Activity Report for the period ending December 31, 1974. Progress from the beginning of FY75 (July 1, 1974) to the end of the second quarter of FY75 (December 31, 1974) was measured, as instructed in Section B.

(3) Sub-Index 2.3. Surveillance and Enforcement Actions

The number of field surveillance and enforcement actions taken during the first two quarters of FY75 was taken from the State Activity Report for the period ending December 31, 1974. This was compared to the number of non-complying sources reported at the beginning of the period (July 1, 1974). However, the number of stack tests was not included in the State Activity

Table II-11. Converting Values to Scores
Index 1. GOAL ATTAINMENT

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score= 1) Low to:	(Score= 2) to:	(Score= 3) to:	(Score= 4) to:
AQ Deviation Improvement Sub-Indicators								
1.1.1.1.(a)TSP	-225.0	+82.4	36	G	-71.30	+5.55	+44.00	+82.40
1.1.1.2.(a)TSP	Not computed							
1.2.1.1.(a)SO_2	-152.0	+75.2	6	G	-38.40	+18.40	+46.80	+75.20
1.2.1.2.(a)SO_2	Not computed							
1.3.1.1.(a)CO	-521.3	+98.0	21	G	-211.65	-56.83	+20.59	+98.00
1.3.1.2.(a)CO	Not computed							
1.4.1.1.(a)O_x	-525.0	+99.3	7	G	-212.85	-56.78	+21.26	+99.30
1.5.1.1.(a)NO_2	Not computed							
AQ Improvement Sub-Indicators								
1.1.1.1.(b)TSP	-59.5	+19.0	5	A	-39.88	-20.25	-.63	+19.00
1.1.1.2.(b)TSP	Not computed							
1.2.1.1.(b)SO_2	-71.1	+80.4	28	A	-33.23	+4.65	+42.53	+80.40
1.2.1.2.(b)SO_2	Not computed							
1.3.1.1.(b)CO	-20.4		1		Only 1 value (Md)			
1.3.1.2.(b)CO	Not computed							
1.4.1.1.(b)O_x	+24.1	+45.2	2		Only 2 values (Va., Pa.)			
1.5.1.1.(b)NO_2	Not computed							
Emission Reduction Indicators:								
1.1.2. TSP	-63.3	+69.0	55	0=mid-point; break-points	-20.00	0.00	+20.00	+69.00
1.2.2. SO_2	-949.6	+41.8	55		-25.00	0.00	+20.00	+41.80
1.3.2. CO	-471.6	+75.3	55		-25.00	0.00	+20.00	+75.30
1.4.2. HC	-90.3	+63.3	55		-20.00	0.00	+20.00	+63.30
1.5.2. NO_2	-233.3	+64.5	55		-20.00	0.00	+20.00	+64.50
PRMS Indicators:								
1.1.3. TSP	+49	0	47	G	+24.5	+12.3	+3.1	0
1.2.3. SO_2	+ 4	0	45	A	+ 3.1	+ 1.1	+0.1	0
1.3.3. CO	+12	0	21	G	+ 6.1	+ 2.1	+0.1	0
1.4.3. O_x	+ 5	0	8	G	+ 2.1	+ 1.1	+0.1	0
1.5.3. NO_2	(no PRMS analysis)							

Table II-12. Scoring and Weighting
Index 1. GOAL ATTAINMENT

STATE: Sample **REGION:**

Measure	**Sub-Indicator** Value	Score	Wt.	Wtd. Score	**Indicator** Value	Score	Wt.	Wtd. Score	**Sub-Index** Score	Wt.	Wtd. Score	**Index Score**
1.1.1.1.(a)	24.4	3	1.0	3.00								
1.1.1.1.(b)												
1.1.1.2.(a)	nc		0									
1.1.1.2.(b)	nc		0									
1.1.1.AAQI						3.00	.40	1.20				
1.1.2.E.R.					-2.8	2	.30	.60				
1.1.3.PRMS					32(107)	1	.30	.30				
1.1.TSP									2.10	.25	.53	
1.2.1.1.(a)												
1.2.1.1.(b)	-1.3	2	1.0	2.00								
1.2.1.2.(a)	nc		0									
1.2.1.2.(b)	nc		0									
1.2.1.AAQI						2.00	.40	.80				
1.2.2.E.R.					-2.9	2	.30	.60				
1.2.3.PRMS					2(30)	2	.30	.60				
1.2.SO_2									2.00	.25	.50	
1.3.1.1.(a)	87.8	4	1.0	4.00								
1.3.1.1.(b)												
1.3.1.2.(a)	nc		0									
1.3.1.2.(b)	nc		0									
1.3.1.AAQI						4.00	.40	1.60				
1.3.2.E.R.					-5.4	2	.30	.60				
1.3.3.PRMS					3(6)	2	.30	.60				
1.3.CO									2.80	.25	.70	
1.4.1.1.(a)	85.0	4	1.0	4.00								
1.4.1.1.(b)												
1.4.1.AAQI						4.00	.57	2.28				
1.4.2.E.R.					-7.7	2	.43	.86				
1.4.3.PRMS					—		0	--				
1.4.O_x/HC									3.14	.25	.79	
1.5.1.1.(a)	nc											
1.5.1.1.(b)												
1.5.1.						nc						
1.5.2.					nc							
1.5.3.					nc							
1.5.NO_2									nc	0		
1. GOAL ATTAINMENT												2.52

Report. Thus indicators 2.3.1. and 2.3.2. could not be computed. The other indicators and sub-indicators were computed as instructed in Section B.

(4) Sub-Index 2.4. Monitoring and Reporting Air Quality and Emissions

For each pollutant indicator (2.4.1. to 2.4.4.; NO_2 was not computed):

(a) AQCR average percent of needed stations added sub-indicators were computed as instructed in Section B. Data was taken from the 1972 Monitoring and Trends Report for the number of stations needed to complete the monitoring networks, and from the 1973 trends report for the number of stations added from 1972 to 1973.

(b) Percent of AQCRs needed stations that attained complete networks sub-indicators were computed as instructed in Section B. 1972 data for AQCRs needing stations and 1973 data for number of AQCRs that attained complete networks in 1973 were taken from the Monitoring and Trends Report for 1972 and 1973.

(c) The SAROAD sufficiency score for 1973, computed as instructed in Section B, was based on data taken from the May 1974 AEROS Status Report.

The sub-indicator for emissions reporting (2.4.6.1.) was not computed because the missing data items report for the previous period (1972) could not be obtained, and thus the number of missing items completed from 1972 to 1973 could not be computed.

The ranges of all values and values of scoring intervals for all computed sub-indicators or indicators under index 2 are shown on Table II-13. For a sample state the computed values, scores, weights and weighted scores for index 2 measures are shown on Table II-14.

c. Index 3. ACHIEVEMENT

(1) Sub-Index 3.1. Source Compliance

Data for source compliance status at the end of the second quarter of FY75 is taken from the State Activity Report. Indicators are computed per instructions in Section B.

(2) Sub-Index 3.2. Monitoring and Reporting Air Quality and Emissions

For each pollutant indicator (3.2.1. to 3.2.4.; NO_2 was not computed):

(a) AQCR average percent of required network sub-indicators was computed as instructed in Section B, using the 1973 Monitoring and Trends Report.

(b) Percent of AQCRs with required network sub-indicators was also computed using the 1973 trends report, per instructions in Section B.

(c) Percent of pollutant-methods that are not unacceptable was computed per instructions using the 1973 trends report. No sub-indicator for TSP was computed, because the federal reference method was used for all stations that reported to

Table II-13. Converting Values to Scores
Index 2. PROGRESS

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score= 1) Low to:	(Score= 2) to:	(Score= 3) to:	(Score= 4) to:
MBO Commitments								
Sub-Indicators:								
2.1.1.1.	-870	+4,000		−∞ → 0 0 → 99 100 → 199 200 → +∞	0	+99.9	+199.9	+4000.0
2.1.1.2.	-2,100	+400			0	+99.9	+199.9	+400.0
2.1.1.3.	-17,100	+200			0	+99.9	+199.9	+200.0
2.1.1.4.	-1,900	+560			0	+99.9	+199.9	+560.0
2.1.1.5.	-590	+12,450			0	+99.9	+199.9	+12450.0
2.1.1.6.	-3,300	+400			0	+99.9	+199.9	+400.0
2.1.1.7.	0	+21,100			0	+99.9	+199.9	+21100.0
2.1.1.8.	0	+16,200			0	+99.9	+199.9	+16200.0
Source Compliance								
Indicators:								
2.2.1.	-630	+430	55	−∞ → 0 0 → 49 50 → 99 100 → +∞	0.0	+49.9	+99.0	+430.0
2.2.2.	-1100	+310	55		0.0	+49.9	+99.0	+310.0
Surveillance & Enforcement Actions								
Indicators:								
2.3.1.	Not computed							
2.3.2.	Not computed							
2.3.3.	0	+100		G	+50	+87.50	+93.75	+100.00
Enforcement								
Sub-Indicators:								
2.3.4.1.	0	+826.0	48	G	+0.24	+0.99	+3.24	+826.00
2.3.4.2.	0	+36.1	48	G	0.00	+0.33	+0.99	36.10
2.3.4.3.	0	+474.0	48	G	0.00	+0.33	+0.99	+474.00

Table II-13. Converting Values to Scores
(continued) Index 2. PROGRESS

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score= 1) Low to:	(Score= 2) to:	(Score= 3) to:	(Score= 4) to:
Monitoring & Reporting								
% of Needed Stations Added Sub-Indicators:								
2.4.1.1.	-200	+100	29	A	0	+49.9	+99.9	+100.0
2.4.2.1.	0	+100	43	A				
2.4.3.1.	-25	+100	21	A				
2.4.4.1.	-400	+100	34	A				
2.4.5.1.	Not computed							
% of Needed AQCRs Attained Sub-Indicators:								
2.4.1.2.	-100	+100	29	A	0	+49.9	+99.9	+100.0
2.4.2.2.	-100	+100	43	A				
2.4.3.2.	-100	+100	21	A				
2.4.4.2.	-100	+100	34	A				
2.4.5.2.	Not computed							
SAROAD Sufficiency Score Sub-Indicators:								
2.4.1.3.	+33.3	+100	54	G	+83.33	+91.67	+95.84	+100.00
2.4.2.3.	0	+100	52	G	+49.99	+74.99	+87.49	+100.00
2.4.3.3.	0	+100	33	A	+24.99	+49.99	+74.99	+100.00
2.4.4.3.	0	+100	24	A	+24.99	+49.99	+74.99	+100.00
2.4.5.3.	Not computed							
Emissions Rptg. Sub-Indicator:								
2.4.6.1.	Not computed							

Table II-14. Scoring and Weighting
Index 2. PROGRESS

STATE: Sample **REGION:**

Measure	Sub-Indicator Value	Score	Wt.	Wtd. Score	Indicator Value	Score	Wt.	Wtd. Score	Sub-Index Score	Wt.	Wtd. Score	Index Score
2.1.1.1.	39	2	.1	.2								
2.1.1.2.	27	2	.15	.3								
2.1.1.3.	-55	1	.15	.15								
2.1.1.4.	38	2	.15	.3								
2.1.1.5.	39	2	.15	.3								
2.1.1.6.	-200	1	.1	.1								
2.1.1.7.	62	2	.1	.2								
2.1.1.8.	130	3	.1	.3								
2.1.1.						1.85	1.0	1.85				
2.1. Meeting Com.									1.85	.25	.62	
2.2.1.					24	2	.5	1				
2.2.2.					17	2	.5	1				
2.2. Source Compl.									2.00	.25	.50	
2.3.1.					nc		.0					
2.3.2.					nc		.0					
2.3.3.					100	4	.2	.8				
2.3.4.1.	60	2	.2	.4								
2.3.4.2.	0	1	.4	.4								
2.3.4.3.	5	2	.4	.8								
2.3.4.						1.6	.8	1.28				
2.3. Surv. & Enf.									2.08	.25	.52	
2.4.1.1.	100	4	.35	1.4								
2.4.1.2.	100	4	.35	1.4								
2.4.1.3.	77.6	1	.30	.3								
2.4.1. TSP						3.1	.25	.78				
2.4.2.1.	80	3	.35	1.05								
2.4.2.2.	60	3	.35	1.05								
2.4.2.3.	80.2	3	.3	.9								
2.4.2. SO_2						3	.25	.75				
2.4.3.1.	100	4	.35	1.4								
2.4.3.2.	100	4	.35	1.4								
2 4.3.3.	12	1	.30	.3								
2.4.3. CO						3.1	.25	.78				
2.4.4.1.	0	1	.35	.35								
2.4.4.2.	0	1	.35	.35								
2.4.4.3.	0	1	.30	.30								
2.4.4. O_x						1.0	.25	.25				
2.4.5.1.	nc											
2.4.5.2.	nc											
2.4.5.3.	nc											
2.4.5. NO_2						nc	0					
2.4.6.1.	nc											
2.4.6. Em.						nc	0					
2.4. Monitoring									2.56	.25	.64	
2. PROGRESS												2.28

SAROAD. Only one station using an unacceptable method for CO and only two states for SO_2 were reported.

Emissions reporting sub-indicators (3.2.6.1. and 3.2.6.2.) were computed using a list of the number of sources on the NEDS verification file as of May 1974, and the Missing Data Items Report in the May 1974 AEROS Status Report.

(3) Sub-Index 3.3. Completing Plans and Revisions

The percentage of required SIP portions completed was computed per instructions in Section B using information from the latest available SIP Progress Report (January 1 to June 30, 1974).

Table II-15 shows ranges of values and scoring intervals for all index 3 sub-indicators or indicators, while Table II-16 shows computed values, scores, weights and weighted scores for a sample state.

2. Need Indices

a. Index 4. PROBLEM

(1) Sub-Index 4.1. Ambient Air Quality Problem

For each pollutant indicator (4.1.1. to 4.1.4.; NO_2 was not computed):

(a) Air Quality Deviation Indication (AQDI) sub-indicators for the TSP and SO_2 primary annual standards were computed as instructed in Section B, except that in place of the TSP annual geometric mean the 50th percentile values of the frequency distribution for TSP stations were used, and in

Table II-15. Converting Values to Scores
Index 3. ACHIEVEMENT

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=1) Low to:	(Score=2) to:	(Score=3) to:	(Score=4) to:
Source Compliance								
Indicators:								
3.1.1.	0	+100	55	G	+49.9	+74.9	+87.4	+100.0
3.1.2.	0	+100	55	A	+24.9	+49.9	+74.9	+100.0
Monitoring & Reporting								
% of Required stations								
Sub-Indicators:								
3.2.1.1.	0	+100	55		+49.9	+74.9	+99.9	+100.0
3.2.2.1.	0	+100	55					
3.2.3.1.	0	+100	55					
3.2.4.1.	0	+100	55					
3.2.5.1.	Not computed							
% of AQCRs								
Sub-Indicators:								
3.2.1.2.	0	+100	55		+49.9	+74.9	+99.9	+100.0
3.2.2.2.	0	+100	55					
3.2.3.2.	0	+100	55					
3.2.4.2.	0	+100	55					
3.2.5.2.	Not computed							
Pollutant-Methods								
Sub-Indicators:								
3.2.1.3.	(All methods reported were Federal Reference Method)							
3.2.2.3.	(Only 2 states used unacceptable methods, Fla. & Minn.)							
3.2.3.3.	(Only 1 method reported was unacceptable)							
3.2.4.3.	0	+100	55	A	+49.9	+74.9	+99.9	+100.0
3.2.5.3.	Not computed							
Emissions Rptg.								
Sub-Indicators:								
3.2.6.1.	0	+100	54	G	+49.90	+74.90	+87.50	+100.0
3.2.6.2.	+64.2	0	53	A	+24.09	+16.06	+8.03	0
Completing Plans								
Indicator:								
3.3.1.	+55.2	+100.0	55	A	+66.39	+77.59	+88.79	+100.00

Table II-16. Scoring and Weighting
Index 3. ACHIEVEMENT

STATE: Sample **REGION:**

Measure	Sub-Indicator Value	Score	Wt.	Wtd. Score	Indicator Value	Score	Wt.	Wtd. Score	Sub-Index Score	Wt.	Wtd. Score	Index Score
3.1.1.					69	2	.50	1.00				
3.1.2.					47	2	.50	1.00				
3.1. Source Compl.									2.00	.40	.80	
3.2.1.1.	100	4	.50	2.00								
3.2.1.2.	100	4	.50	2.00								
3.2.1.3.	nc		0									
3.2.1. TSP						4.00	.175	.70				
3.2.2.1.	67	2	.50	1.00								
3.2.2.2.	67	2	.50	1.00								
3.2.2.3.	nc											
3.2.2. SO_2						2.00	.175	.35				
3.2.3.1.	100	4	.50	2.00								
3.2.3.2.	100	4	.50	2.00								
3.2.3.3.	nc											
3.2.3. CO						4.00	.175	.70				
3.2.4.1.	100	4	.35	1.40								
3.2.4.2.	100	4	.35	1.40								
3.2.4.3.	100	4	.30	1.20								
3.2.4. O_x						4.00	.175	.70				
3.2.5.1.	nc											
3.2.5.2.	nc											
3.2.5.3.	nc											
3.2.5. NO_2						nc	0					
3.2.6.1.	95	4	.50	2.00								
3.2.6.2.	3.3	4	.50	2.00								
3.2.6.						4.00	.30	1.20				
3.2. Monitoring									3.65	.30	1.09	
3.3.1.					86.7	3	1.00	3.00				
3.3. Completing Plans									3.00	.30	.90	
3. ACHIEVEMENT												2.79

place of the SO_2 annual arithmetic mean the 70th percentile values of the frequency distribution for SO_2 stations were used.

Frequency distributions were obtained from the preliminary 1973 Air Quality Data-Annual Statistics. Stations with less than 15 observations during 1973 were eliminated; once adequate data is available and annual means computed by SAROAD on the basis of stations meeting SAROAD sufficiency criteria are used, such an arbitrary elimination of stations will not be needed.

The TSP and SO_2 annual AQDI were equal to:

$$\sum^{\text{AQCR}} \sum^{\text{SES}} \frac{\left(\begin{array}{c}\text{TSP } 50\underline{\text{th}} \text{ or } SO_2\\ 70\underline{\text{th}}\ \%\text{ value}\end{array}\right) - \left(\begin{array}{c}\text{TSP or } SO_2 \text{ primary}\\ \text{annual standard}\end{array}\right)}{(\text{TSP or } SO_2 \text{ primary annual standard})}$$

where $\sum^{\text{SES}}$ = sum over all stations in an AQCR with TSP 50th or SO_2 70th % value exceeding standard

and $\sum^{\text{AQCR}}$ = sum over all AQCRs in a state.

Note that this AQDI is the same as the air quality deviation computed for AAQ improvement under index 1, except that for the latter a given set of stations that reported in both 1972 and 1973 was used, whereas in the former all stations reporting in 1973 were used.

Short-term values were not available from SAROAD. Therefore, the AQDI for the short-term standards (TSP and SO_2 24-hour, and CO 1-hour) were not computed. Also, substitutions were necessary to compute the AQDI for the CO 8-hour and O_x 1-hour standard. For these a product of the percent of values exceeding standards and the megnitude of deviation of the second highest value (since the standards are worded in terms of exceeding standards more than once a year) is used. Data was from the 1973 Monitoring and Trends Report.

The AQDI for the O_x primary 1-hour standard was equal to:

$$\sum^{AQCR} \sum^{SES} \left[\frac{\left(\begin{matrix}\text{\# of 1-hr. values}\\ \text{exceeding std.}\end{matrix}\right) \times 100}{\begin{matrix}\text{total \# of valid 1-hr.}\\ \text{values}\end{matrix}}\right] \left[\frac{\left(\begin{matrix}\text{2nd highest}\\ \text{1-hr.value}\end{matrix}\right) - (\text{Std.})}{\text{Std.}}\right]$$

where $\sum^{SES}$ = sum over all stations in an AQCR with 2 or more valid values exceeding the standard

and $\sum^{AQCR}$ = sum over all AQCRs in a state.

(Note: The number of values exceeding a standard is multiplied by 100 only to avoid numbers with a large number of decimal places.)

The AQDI for the CO 8-hour standard is computed in the same way. However, the second highest 8-hour average was not accessible for the 1973 trends report. Thus the highest 8-hour average was used:

$$\sum^{AQCR} \sum^{SES} \left[\frac{\left(\begin{matrix}\text{\# of 8-hr.avgs.}\\ \text{exceeding std.}\end{matrix}\right) \times 100}{\text{total \# of 8-hr. avgs.}}\right] \left[\frac{\left(\begin{matrix}\text{highest 8-hr}\\ \text{average}\end{matrix}\right) - (\text{Std.})}{\text{Std.}}\right]$$

where $\sum^{SES}$ = sum over all stations in an AQCR with 2 or more 8-hr. averages exceeding the standard

and $\sum^{AQCR}$ = sum over all AQCRs in a state.

The AQDI for each pollutant can be corrected to account for the percentage completion of the monitoring network in each AQCR, by dividing the AQDI for each AQCR by the percent of the minimum required number of stations in the AQCR that reported to SAROAD (see Section A, p. II-30 for further discussion of the correction factor). Both the uncorrected and corrected AQDIs were computed for the trial run.

(b) Population in AQCRs with positive AQDI was computed as instructed in Section B for the pollutant-standards for which an AQDI was computed, namely TSP and SO_2 annual, CO 8-hour, and O_x 1-hour. Population figures for state-AQCR combinations were given in an NADB printout; however, the population figures were for different years. Therefore, the 1970 population of AQCRs, derived from the 1970 Census, and printed in the OBERS projections for the AQCRs was used. To derive state portions of the population of interstate AQCRs, the percentage share of total AQCR population was derived from the NADB printout and applied to the OBERS figures.

(2) Sub-Index 4.2. Emissions and Emission Sources

Urbanized area population (1970) and urbanized (SMSA) land area were derived from the 1972 Statistical Abstract of the U.S. Projected population and manufacturing growth rates were computed for the period 1970 to 1980 and 1969 to 1980, respectively, on the basis of OBERS projections. Total emissions were drawn from a NEDS printout of emission summary by state dated January 1975, considered generally representative of 1973 emissions.

(3) Sub-Index 4.3. Emission Reduction Needed

Because state emission goals were not yet available from the SIP automated information system, the values for the indicators under sub-index 4.3. were not computed.

In accordance with the instructions in Section B, the ranges of computed values for measures under index 4 and the ranges of the scoring intervals are listed on Table II-17. Table II-18 lists computed values, scores, weights, and weighted scores for a sample state.

b. Index 5. OPERATIONAL REQUIREMENTS

(1) Sub-Index 5.1. Source Compliance and Enforcement

Indicator values were computed per instructions in Section B from data in the State Activity Report for the period ending December 31, 1974, and from the Dun and Bradstreet DMI file.

(2) Sub-Index 5.2. Monitoring and Reporting Air Quality and Emissions

For each pollutant indicator (5.2.1. to 5.2.4.; NO_2 values were not computed):

(a) Number of stations that need to be added to complete the monitoring network was based on information from the 1973 Monitoring and Trends Report. Values were computed as instructed in Section B.

(b) Number of AQCRs with less than the minimum required network was computed to indicate the number of AQCRs whose monitoring networks had to be completed. Data from the 1973

Table II-17. Converting Values to Scores
Index 4. PROBLEM

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score= 1) Low to:	(Score= 2) to:	(Score=3) to:	(Score= 4) to:
AAQ Problem								
AQDI								
Sub-Indicators:								
4.1.1.1. (a)TSP	0	+13.49	45	G	+0.42	+1.69	+6.75	+13.49
4.1.1.1. (b)TSP	0	+25.52	45	G	+0.80	+3.19	+12.76	+25.52
4.1.1.2. (a)TSP	Not computed							
4.1.1.2. (b)TSP								
4.1.2.1. (a)SO_2	0	+17.25	46	G	+0.27	+1.08	+4.31	+17.25
4.1.2.1. (b)SO_2	0	+16.59	46	G	+0.26	+1.04	+4.15	-6.59
4.1.2.2. (a)SO_2	Not computed							
4.1.2.2. (b)SO_2								
4.1.3.1. (a)CO	0	+351.06	33	G	+10.97	+43.88	+175.53	+351.06
4.1.3.1. (b)CO	0	+701.66	33	G	+10.96	+43.85	+175.42	+701.66
4.1.3.2. (a)CO	Not computed							
4.1.3.2. (b)CO								
4.1.4.1. (a)O_x	0	+181.29	30	G	+2.83	+11.33	+45.32	+181.29
4.1.4.1. (b)O_x	0	+381.16	30	G	+5.96	+23.82	+95.29	+381.16
4.1.5.1. (a)NO_2	Not computed							
4.1.5.1. (b)SO_2								
Population (1000)								
Sub-Indicators:								
4.1.1.3. TSP	0	+18,934.50	45	G	+1,183.41	+2,366.81	+4,733.63	+18,934.50
4.1.1.4.	Not computed							
4.1.2.3. SO_2	0	+14,532.50	46	G	+454.14	+908.28	+3,633.13	+14,532.50
4.1.2.4.	Not computed							
4.1.3.3. CO	0	+19,723.10	33	G	+308.17	+1,232.69	+4,930.78	+19,723.10
4.1.3.4.	Not computed							
4.1.4.2. O_x	0	+17,231.70	30	G	+538.49	+1,076.98	+4,307.93	+17,231.70
4.1.5.2. NO_2	Not computed							
Emissions & Em. Sources								
Indicators:								
4.2.1. Pop.(1000)	0	+16,147.0	51	G	+504.60	+1,009.20	+4,036.80	+16,147.00
4.2.2. Land	0	+47,357.0	51	G	+1,479.90	+5,919.60	+11,839.30	+47,357.00
4.2.3. Pop.Gr.	-0.5	+37.1	51	A	+8.90	-13.30	+19.30	+37.10
4.2.4. Manu.Gr.	+45	+111.0	51	A	+53.25	+61.50	+69.75	+111.00
Emissions (1000T/yr)								
Sub-Indicators:								
4.2.5.1. TSP	+0.03	+2,030.7	53	G	+126.92	+253.84	+507.67	+2,030.70
4.2.5.2. SO_2	+0.04	+3,411.8	53	G	+106.62	+426.47	+1,705.88	+3,411.80
4.2.5.3. CO	+0.17	+9,407.9	53	G	+587.98	+1,175.97	+2,351.93	+9,407.90
4.2.5.4. HC	+0.29	+2,351.8	53	G	+146.97	+293.94	+587.88	+2,351.80
4.2.5.5. NO_x	+1.10	+3,340.5	53	G	+104.36	+417.43	+834.85	+3,340.50
Emission Reduction Needed								
Indicators:	Not computed							
4.3.1. TSP								
4.3.2. SO_2								
4.3.3. CO								
4.3.4. HC								
4.3.5. NO_x								

(a) = Corrected
(b) = Uncorrected

Table II-18. Scoring and Weighting
Index 4. PROBLEM

STATE: Sample REGION:

Measure	Sub-Indicator Value	Score	Wt.	Wtd. Score	Indicator Value	Score	Wt.	Wtd. Score	Sub-Index Score	Wt.	Wtd. Score	Index Score
4.1.1.1.	(a) 3.14	3	.50	1.5								
4.1.1.2.	nc	0										
4.1.1.3.	18,934	4	.50	2.0								
4.1.1.4.	nc	0										
4.1.1.TSP						3.5	.25	.88				
4.1.2.1.	(a) 4.03	3	.50	1.5								
4.1.2.2.	nc	0										
4.1.2.3.	14,533	4	.50	2.0								
4.1.2.4.	nc	0										
4.1.2.SO_2						3.5	.25	.88				
4.1.3.1.	(a)351.06	4	.50	2.0								
4.1.3.2.	nc	0										
4.1.3.3.	16,861	4	.50	2.0								
4.1.3.4.	nc	0										
4.1.3.CO						4.0	.25	1.00				
4.1.4.1.	(a) 14.90	3	.50	1.5								
4.1.4.2.	17,232	4	.50	2.0								
4.1.4.O_x						3.5	.25	.88				
4.1.5.1.	nc	0										
4.1.5.2.	nc	0										
4.1.5.NO_2					nc	0						
4.1.AAQ Problem									3.64	.50	1.82	
4.2.1.					14,267	4	.30	1.20				
4.2.2.					15,408	4	.10	.40				
4.2.3.					14.7	3	.10	.30				
4.2.4.					49	1	.10	.10				
4.2.5.1.	268.6	3	.20	.60								
4.2.5.2.	1026.9	3	.20	.60								
4.2.5.3.	5149.5	4	.20	.80								
4.2.5.4.	1273.2	4	.20	.80								
4.2.5.5.	990.3	4	.20	.80								
4.2.5.						3.6	.40	1.44				
4.2.Em & Em. Sources									3.44	.50	1.72	
4.3.1.					nc							
4.3.2.					nc							
4.3.3.					nc							
4.3.4.					nc							
4.3.5.					nc							
4.3.Em. Reduc. Needed									nc	0		
4.PROBLEM												3.54

trends report was used to compute values according to instructions in Section B.

(c) Improvement needed in SAROAD sufficiency score was computed per Section B instructions using the sufficiency score computed for index 2 from the AEROS Status Report (May 1974).

Sub-indicators for the emissions reporting indicator were computed as instructed in Section B from a list of the number of sources on the NEDS verification file as of May 1974, and from the Missing Data Items Report in the May 1974 AEROS Status Report.

(3) Sub-Index 5.3. Completing Plans and Revisions

The number of SIP portions that need to be completed was the number of portions declared deficient by EPA, including those for which EPA had promulgated regulations, as reported in the January 1 to June 30, 1974 SIP Progress Report.

For all computed measures under index 5, the range of values and the ranges of the scoring intervals are listed on Table II-19. Values, scores, weights, and weighted scores for all computed measures for a sample state are listed on Table II-20.

State background information for the 50 states and the District of Columbia is presented in Appendix II-D. Population figures are from the 1970 Census and published reports based on the decennial census, unless otherwise specified.

Table II-19. Converting Values to Scores
Index 5. OPERATIONAL REQUIREMENTS

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score= 1) Low to:	(Score= 2) to:	(Score= 3) to:	(Score= 4) to:
Source Compliance & Enforcement								
Indicators:								
5.1.1.	0	+727	55	G	+5.7	+22.7	+90.9	+727.0
5.1.2.	0	+146	55	G	+2.3	+9.1	+36.5	+146.0
5.1.3.	0	+185	55	G	+2.9	+11.6	+46.3	+185.0
5.1.4.	+390	+52,529	51	G	+1204.7	+3648.7	+13,424.8	+52,529.0
Monitoring & Reporting								
No. of Needed Stations								
Sub-Indicators:								
5.2.1.1.	0	+26	55	0	0	+2.9	+6.9	+26.0
5.2.2.1.	0	+28	55	1-2	0	+2.9	+6.9	+28.0
5.2.3.1.	0	+10	55	3-6	0	+2.9	+6.9	+10.0
5.2.4.1.	0	+13	55	7+	0	+2.9	+6.9	+13.0
5.2.5.1.	Not computed							
No. of AQCRs								
Sub-Indicators:								
5.2.1.2.	0	+10	55	0	0	+1.9	+2.9	+10.0
5.2.2.2.	0	+8	55	1	0	+1.9	+2.9	+8.0
5.2.3.2.	0	+4	55	2	0	+1.9	+2.9	+4.0
5.2.4.2.	0	+6	55	3+	0	+1.9	+2.9	+6.0
5.2.5.2.	Not computed							
Improvement in SAROAD score								
Sub-Indicators:								
5.2.1.3.	0	+66.7	54	G	+4.17	+8.34	+16.68	+66.70
5.2.2.3.	0	+100.0	54	G	+12.50	+25.00	+50.00	+100.00
5.2.3.3.	0	+100.0	33	A	+25.00	+50.00	+75.00	+100.00
5.2.4.3.	0	+100.0	24	A	+25.00	+50.00	+75.00	+100.00
5.2.5.3.	Not computed							
Emissions Rptg.								
Sub-Indicators:								
5.2.6.1.	0	+1,420	55	G	+22.2	+88.8	+355.0	+1,420.0
5.2.6.2.	+344	+46,921	53	G	+1,799.5	+5,166.1	+23,632.5	+46 921.0
Completing Plans								
Indicator:								
5.3.1.	0	+24	55	G	0	+2.9	+6.9	+24.0

Table II-20. Scoring and Weighting
Index 5. OPERATIONAL REQUIREMENTS

STATE: Sample

REGION:

Measure	Sub-Indicator Value	Score	Wt.	Wtd. Score	Indicator Value	Score	Wt.	Wtd. Score	Sub-Index Score	Wt.	Wtd. Score	Index Score
5.1.1.					174	4	.20	.80				
5.1.2.					8	2	.20	.40				
5.1.3.					9	2	.30	.60				
5.1.4.					2317	2	.30	.60				
5.1. Source Compl.									2.40	.40	.96	
5.2.1.1.	0	1	.30	.30								
5.2.1.2.	0	1	.30	.30								
5.2.1.3.	18.8	4	.40	1.60								
5.2.1. TSP						2.50	.175	.44				
5.2.2.1.	2	2	.30	.60								
5.2.2.2.	1	2	.30	.60								
5.2.2.3.	37.1	3	.40	1.20								
5.2.2. SO_2						2.40	.175	.42				
5.2.3.1.	0	1	.30	.30								
5.2.3.2.	0	1	.30	.30								
5.2.3.3.	28.6	2	.40	.80								
5.2.3. CO						1.40	.175	.24				
5.2.4.1.	1	2	.30	.60								
5.2.4.2.	1	2	.30	.60								
5.2.4.3.	25.0	1	.40	.40								
5.2.4. O_x						1.60	.175	.28				
5.2.5.1.	nc											
5.2.5.2.	nc											
5.2.5.3.	nc											
5.2.5. NO_2						nc	0					
5.2.6.1.	105	3	.50	1.50								
5.2.6.2.	3918	2	.50	1.00								
5.2.6. Em.						2.50	.30	.75				
5.2. Monitoring									2.13	.30	.64	
5.3.1.					13	4	1.0	4.00				
5.3. Completing Plans									4.00	.30	1.20	
5. OPERATIONAL REQUIREMENTS												2.80

D. Formats for System Results

The way the results of the system are organized and the degree of summarization of the results depend on the uses to which the results will be put. Three alternative formats for organizing system results are presented in this section.

(1) Output format #1 presents the computed values of the measures at the lowest levels of aggregation for which values were calculated (sub-indicators or indicators) for a state. Figures II-8a to II-8e illustrate output format #1 for component values of indices 1 to 5, respectively.

(2) Output format #2 allows examination of a state's scores for all measures as well as all states' scores for a particular measure. Figures II-9a to II-9e illustrate output format #2 for the scores for indices 1 to 5, respectively, each containing all the components of the index. Each column represents a component sub-indicator, indicator, or sub-index of the index, or the index itself (see Section A for discussion of each measure). The weight of each component, expressed as a percentage of 100, is given in the parentheses at the top of each column. The index score for each state is filled in on line (1), each of the sub-index scores on line (2), each of the indicator scores on line (3) and each sub-indicator score on line (4).

Figure II-10 represents a summary for all states of output format #2 for scores for the 5 indices and 18 sub-indices. Each column is a sub-index or index with the weights of the sub-indices

Fig. II-8a. Output Format #1, State Values for Index 1

	1. GOAL ATTAINMENT																									
	1.1. TSP						1.2. SO_2						1.3. CO						1.4. O_x				1.5. NO_2			
	1.1.1. AAQI				1.1.2. Em. Reduction	1.1.3 PRMS Flags (# of Stns. Analyzed)	1.2.1. AAQI				1.2.2. Em. Reduction	1.2.3. PRMS Flags (# of Stns. Analyzed)	1.3.1. AAQI				1.3.2. Em. Reduction	1.3.3. PRMS Flags (# of Stns. Analyzed)	1.4.1. AAQI		1.4.2. Em. Reduction	1.4.3. PRMS Flags (# of Stns. Analyzed)	1.5.1. AAQI		1.5.2. Em. Reduction	1.5.3. PRMS Flags (# of Stns. Analyzed)
STATE	1.1.1.1.(a)>Annual	1.1.1.1.(b)≤Annual	1.1.1.1.(a)>24-Hour	1.1.1.2.(b)≤24-Hour			1.2.1.1.(a)>Annual	1.2.1.1.(b)≤Annual	1.2.1.2.(a)>24-Hour	1.2.1.2.(b)≤24-Hour			1.3.1.1.(a)>8-Hour	1.3.1.1.(b)≤8-Hour	1.3.1.2.(a)>1-Hour	1.3.1.2.(b)≤1-Hour			1.4.1.1.(a)>1-Hour	1.4.1.1.(b)≤1-Hour			1.5.1.1.(a)>Annual	1.5.1.1.(b)≤Annual		

Fig. II-8b. Output Format #1, State Values for Index 2

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	2. PROGRESS																															
	2.1. Meeting Commitments								2.2. Source Compl.		2.3. Surveillance and Enforcement						2.4. Monitoring and Reporting Air Quality and Emissions															
	2.1.1. Source Compliance													2.3.4. Enf. Actions			2.4.1. TSP			2.4.2. SO_2			2.4.3. CO			2.4.4. O_x			2.4.5. NO_2			2.4.6. Ems.
STATE	2.1.1.1. Output Ia	2.1.1.2. Output Ib	2.1.1.3. Output Ic	2.1.1.4. Output Ia + d	2.1.1.5. Output Ia, d - f	2.1.1.6. Output If	2.1.1.7. Output Ig(1)	2.1.1.8. Output Ih(1)	2.2.1. Non-Complying Sources Brought Into Compliance	2.2.2. Unknown Sources Whose Status was Determined	2.3.1. Process Inspection, Opacity Observation	2.3.2. Stack Tests	2.3.3. Field Surveillance by State	2.3.4.1. Notices of Violation	2.3.4.2. Abatement Orders	2.3.4.3. Court Proceedings	2.4.1.1. % of Needed Stations Added	2.4.1.2. % of Needed AQCRs Attained	2.4.1.3. SAROAD Sufficiency Score	2.4.2.1. % of Needed Stations Added	2.4.2.2. % of Needed AQCRs Attained	2.4.2.3. SAROAD Sufficiency Score	2.4.3.1. % of Needed Stations Added	2.4.3.2. % of Needed AQCRs Attained	2.4.3.3. SAROAD Sufficiency Score	2.4.4.1. % of Needed Stations Added	2.4.4.2. % of Needed AQCRs Attained	2.4.4.3. SAROAD Sufficiency Score	2.4.5.1. % of Needed Stations Added	2.4.5.2. % of Needed AQCRs Attained	2.4.5.3. SAROAD Sufficiency Score	2.4.6.1. % of Missing NEDS Data Items Completed

Fig. II-8c. Output Format #1, State Values for Index 3

	3. ACHIEVEMENT																			
	3.1. Source Compliance		3.2. Monitoring and Reporting Air Quality and Emissions																	3.3. Comp. Plans & Revisions
			3.2.1. TSP Monitoring			3.2.2. SO_2 Monitoring			3.2.3. CO Monitoring			3.2.4. O_x Monitoring			3.2.5. NO_2 Monitoring			3.2.6. Emissions Reporting		
STATE	3.1.1. % of Sources in Compliance	3.1.2. % of Non-Complying Sources on Schedule	3.2.1.1. % of MR Stns	3.2.1.2. % of AQCRs with Complete Network	3.2.1.3. % of Pollutant-Methods Not Unacceptable	3.2.2.1. % of MR Stns	3.2.2.2. % of AQCPs with Complete Network	3.2.2.3. % of Pollutant-Methods Not Unacceptable	3.2.3.1. % of MR Stns	3.2.3.2. % of AQCPs with Complete Network	3.2.3.3. % of Pollutant-Methods Not Unacceptable	3.2.4.1. % of MR Stns	3.2.4.2. % of AQCRs w/ Complete Network	3.2.4.3. % of Pollutant Method Not Unacceptable	3.2.5.1. % of MR Stns	3.2.5.2. % of AQCRs w/ Complete Network	3.2.5.3. % of Pollutant Method Not Unacceptable	3.2.6.1. % of Sources on NEDS	3.2.6.2. % of NEDS Data Items Missing	3.3.1. % of SIP Portions Completed

Fig. II-8d. Output Format #1, State Values for Index 4

	4. PROBLEM																																					
	4.1. Ambient Air Quality Problem																								4.2. Emissions & Em. Sources									4.3. Reduc. Needed				
	4.1.1. TSP						4.1.2. SO_2						4.1.3. CO						4.1.4. O_x			4.1.5. NO_2							4.2.5. Emissions									
STATE	4.1.1.1.(a) Annual, Corr.	4.1.1.1.(b) Annual, Uncorr.	4.1.1.2.(a) 24-Hour, Corr.	4.1.1.2.(b) 24-Hour, Uncorr.	4.1.1.3. Exposed Pop. (Annual)	4.1.1.4. Exposed Pop. (24-Hour)	4.1.2.1.(a) Annual, Corr.	4.1.2.1.(b) Annual, Uncorr.	4.1.2.2.(a) 24-Hour, Corr.	4.1.2.2.(b) 24-Hour, Uncorr.	4.1.2.3. Exposed Pop. (Annual)	4.1.2.4. Exposed Pop. (24-Hour)	4.1.3.1.(a) 8-Hour, Corr.	4.1.3.1.(b) 8-Hour, Uncorr.	4.1.3.2.(a) 1-Hour, Corr.	4.1.3.2.(b) 1-Hour, Uncorr.	4.1.3.3. Exposed Pop. (8-Hour)	4.1.3.4. Exposed Pop. (1-Hour)	4.1.4.1.(a) 1-Hour, Corr.	4.1.4.1.(b) 1-Hour, Uncorr.	4.1.4.2. Exposed Pop. (1-Hour)	4.1.5.1.(a) Annual, Corr.	4.1.5.1.(b) Annual, Uncorr.	4.1.5.2. Exposed Pop. (Annual)	4.2.1. Urban Pop	4.2.2. Urbanized Land Area	4.2.3. Pop. Growth Rate	4.2.4. Manu. Growth Rate	4.2.5.1. TSP	4.2.5.2. SO_2	4.2.5.3. CO	4.2.5.4. HC	4.2.5.5. NO_2	4.3.1. TSP	4.3.2. SO_2	4.3.3. CO	4.3.4. HC	4.3.5. NO_2

Fig. II-8e. Output Format #1, State Values for Index 5

	5. OPERATIONAL REQUIREMENTS																					
	5.1. Source Compliance & Enforcement				5.2. Monitoring and Reporting Air Quality and Emissions																	5.3. Completing Plans & Revisions
					5.2.1. TSP			5.2.2. SO_2			5.2.3. CO			5.2.4. O_x			5.2.5. NO_2			5.2.6. Em. Rptg.		
STATE	5.1.1. Unknown Sources	5.1.2. Non-Complying Sources Not on Compl. Schedule	5.1.3. Overdue Sources	5.1.4. Sources that Require Field Surveillance	5.2.1.1. # of Stations Needed	5.2.1.2. # of AQCRs With Less Than Required Network	5.2.1.3. Improvement Needed in Sufficiency Score	5.2.2.1. # of Stations Needed	5.2.2.2. # of AQCRs With Less Than Required Network	5.2.2.3. Improvement Needed in Sufficiency Score	5.2.3.1. # of Stations Needed	5.2.3.2. # of AQCRs With Less Than Required Network	5.2.3.3. Improvement Needed in Sufficiency Score	5.2.4.1. # of Stations Needed	5.2.4.2. # of AQCRs With Less Than Required Network	5.2.4.3. Improvement Needed in Sufficiency Score	5.2.5.1. # of Stations Needed	5.2.5.2. # of AQCRs With Less Than Required Network	5.2.5.3. Improvement Needed in Sufficiency Score	5.2.6.1. Sources on NEDS Verification File	5.2.6.2. Missing NEDS Data Items	5.3.1. Needed SIP Portions

Fig. II-9a. Output Format #2, State Scores for Index I

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(1)	Index																																				
(2)	Sub-Indices																																				
(3)	Indicators							(25)	Indicators							(25)	Indicators							(25)	Indicators					(25)	Indicators					(0)	
(4)	Sub-Indi.				(40)	(30)	(30)		Sub-Indicator				(40)	(30)	(30)		Sub-Indi.				(40)	(30)	(30)		$^S/_I$		(40)	(30)	(30)		$^S/_I$						
(Weights)	(100)		(0)						(100)		(0)						(100)		(0)						(100)												
STATE	1.1.1.1.(a)>TSP Annual	1.1.1.1.(b)≤TSP Annual	1.1.1.2.(a)>TSP 24-Hour	1.1.1.2.(b)≤TSP 24-Hour	1.1.1. TSP AAQ Improvement	1.1.2. TSP Em. Reduction	1.1.3. TSP PRMS Flags (# of Stns. Analyzed)	1.1. TSP Goal Attainment	1.2.1.1.(a)>SO_2 Annual	1.2.1.1.(b)≤SO_2 Annual	1.2.1.2.(a)>SO_2 24-Hour	1.2.1.2.(b)≤SO_2 24-Hour	1.2.1. SO_2 AAQ Improvement	1.2.2. SO_2 Em. Reduction	1.2.3. SO_2 PRMS Flags (# of Stns. Analyzed)	1.2. SO_2 Goal Attainment	1.3.1.1.(a)>CO 8-Hour	1.3.1.1.(b)≤CO 8-Hour	1.3.1.2.(a)>CO 1-Hour	1.3.1.2.(b)≤CO 1-Hour	1.3.1. CO AAQ Improvement	1.3.2. CO Em. Reduction	1.3.3. CO PRMS Flags (# of Stns. Analyzed)	1.3. CO Goal Attainment	1.4.1.1.(a)>O_x 1-Hour	1.4.1.1.(b)≤O_x 1-Hour	1.4.1. O_x AAQ Improvement	1.4.2. O_x Em. Reduction	1.4.3. O_x PRMS Flags (# of Stns. Analyzed)	1.4. O_x Goal Attainment	1.5.1.1.(a)>NO_2 Annual	1.5.1.1.(b)≤NO_2 Annual	1.5.1 NO_2 AAQ Improvement	1.5.2. NO_2 Em. Reduction	1.5.3. NO_2 PRMS Flags (# of Stns. Analyzed)	1.5. NO_2 Goal Attainment	1. GOAL ATTAINMENT
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Fig. II-9b. Output Format #2, State Scores for Index 2

(1)	Index																												
(2)	Sub-Indices																												
(3)	Indicators									(25)	Indicators		(25)	Indicators							(25)								
(4)	Sub-Indicators								(100)		(50)	(50)		(0)	(0)	(20)	Sub-Indicators			(80)		Sub-Indicators			(25)	Sub-Indicators			(25)
(Weights)	(10)	(15)	(15)	(15)	(15)	(10)	(10)	(10)									(20)	(40)	(40)			(35)	(35)	(30)		(35)	(25)	(30)	
STATE	2.1.1.1. Output Ia	2.1.1.2. Output Ib	2.1.1.3. Output Ic	2.1.1.4. Output Ia + d	2.1.1.5. Output Ia,d-f	2.1.1.6. Output If	2.1.1.7. Output Ig(1)	2.1.1.8. Output Ih(1)	2.1.1. Source Compliance	2.1. Meeting MBO Commitments	2.2.1. Non-Complying Sources Brought into Compl.	2.2.2. Unknown Sources Whose Status was Determined	2.2. Source Compliance	2.3.1. Process Insp., Opacity Obs.	2.3.2. Stack Tests	2.3.3. Field Surv. by State	2.3.4.1. Notices of Violation	2.3.4.2. Abatement Orders	2.3.4.3. Court Proceedings	2.3.4. Enforcement Actions	2.3. Surveillance & Enf.	2.4.1.1. % of Needed Stns. Added	2.4.1.2. % of Needed AQCRs Attained	2.4.1.3. SAROAD Sufficiency Score	2.4.1. TSP Monitoring	2.4.2.1. % of Needed Stns. Added	2.4.2.2. % of Needed AQCRs Attained	2.4.2.3. SAROAD Sufficiency Score	2.4.2. SO_2 Monitoring
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Fig. II-9b. Output Format #2, State Scores for Index 2 (Continued)

(1)	Index															
(2)	Sub-Indices															
(3)	Indicators														(25)	
(4)	Sub-Indicators			(25)	Sub-Indicators			(25)	Sub-Indicators			(0)	S/I	(0)		
(Weights)	(35)	(35)	(30)		(35)	(35)	(30)		(35)	(35)	(30)					
STATE	2.4.3.1. % of Needed Stns. Added	2.4.3.2. % of Needed AQCRs Attained	2.4.3.3. SAROAD Sufficiency Score	2.4.3. CO Monitoring	2.4.4.1. % of Needed Stns. Added	2.4.4.2. % of Needed AQCRs Attained	2.4.4.3. SAROAD Sufficiency Score	2.4.4. O_x Monitoring	2.4.5.1. % of Needed Stns. Added	2.4.5.2. % of Needed AQCRs Attained	2.4.5.3. SAROAD Sufficiency Score	2.4.5. NO_2 Monitoring	2.4.6.1. % of NEDS Missing Data Items Completed	2.4.6. Emissions Rptg.	2.4. Monitoring & Reporting AQ & Emissions	2. PROCESS
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Fig. II-9c. Output Format #2, State Scores for Index 3

(1)	Index																													
(2)	Sub-Indices																													
(3)	Indicators		(40)	Indicators																						(30)	Ind.	(30)	
(4)	(50)	(50)		Sub-Indicators			(17.5)	Sub-Indicators			(17.5)	Sub-Indicators			(17.5)	Sub-Indicators			(17.5)	Sub-Indicators			(0)	Sub-Ind.		(30)		(100)		
(Weights)				(35)	(35)	(30)		(35)	(35)	(30)		(25)	(35)	(30)		(35)	(35)	(30)		(35)	(35)	(30)		(50)	(50)					
STATE	3.1.1. % of Sources in Compliance	3.1.2. % of Non-Complying Sources on Schedule	3.1. Source Compliance	3.2.1.1. % of MR Stns	3.2.1.2. % of AQCRs with Complete Network	3.2.1.3. % of Pollutant Methods Not Unacceptable	3.2.1. TSP Monitoring	3.2.2.1. % of MR Stns	3.2.2.2. % of AQCRs with Complete Network	3.2.2.3. % of Pollutant Methods Not Unacceptable	3.2.2. SO_2 Monitoring	3.2.3.1. % of MR Stns	3.2.3.2. % of AQCRs with Complete Network	3.2.3.3. % of Pollutant Methods Not Unacceptable	3.2.3. CO Monitoring	3.2.4.1. % of MR Stns	3.2.4.2. % of AQCRs with Complete Network	3.2.4.2. % of Pollutant Methods Not Unacceptable	3.2.4. O_x Monitoring	3.2.5.1. % of MR Stns	3.2.5.2. % of AQCRs with Complete Network	3.2.5.3. % of Pollutant Methods Not Unacceptable	3.2.5. NO_2 Monitoring	3.2.6.1. % of Sources on NEDS	3.2.6.2. % of NEDS Data Items Missing	3.2.6. Emissions Reporting	3.2. Monitoring & Reporting AQ & Emissions	3.3.1. % of SIP Portions Completed	3.3. Completing Plans & Revisions	3. ACHIEVEMENT
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Fig. II-9d. Output Format #2, State Scores for Index 4

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STATE	4.1.1.1.(a) Annual, Corr.	4.1.1.1.(b) Annual, Uncorr.	4.1.1.2.(a) 24-Hour, Corr.	4.1.1.2.(b) 24-Hour, Uncorr.	4.1.1.3. Exposed Pop. (Annual)	4.1.1.4. Exposed Pop. (24-Hr.)	4.1.1. TSP	4.1.2.1.(a) Annual, Corr.	4.1.2.1.(b) Annual, Uncorr.	4.1.2.2.(a) 24-Hour, Corr.	4.1.2.2.(b) 24-Hour, Uncorr.	4.1.2.3. Exposed Pop. (Annual)	4.1.2.4. Exposed Pop. (24-Hr.)	4.1.2. SO_2	4.1.3.1.(a) 8-Hour, Corr.	4.1.3.1.(b) 8-Hour, Uncorr.	4.1.3.2.(a) 1-Hour, Corr.	4.1.3.2.(b) 1-Hour, Uncorr.	4.1.3.3. Exposed Pop.	4.1.3.4. Exposed Pop.	4.1.3. CO	4.1.4.1.(a) 1-Hour, Corr.	4.1.4.1.(b) 1-Hour, Uncorr.	4.1.4.2. Exposed Pop. (1-Hr.)	4.1.4. O_x	4.1.5.1.(a) Annual, Corr.	4.1.5.1.(b) Annual, Uncorr.	4.1.5.2. Exposed Pop. (Annual)	4.1.5. NO_2	4.1. AAQ Problem	4.2.1. Urban Pop.	4.2.2. Urbanized Land Area	4.2.3. Pop. Growth Rate	4.2.4. Manu. Growth Rate	4.2.5.1. TSP	4.2.5.2. SO_2	4.2.5.3. CO	4.2.5.4. HC	4.2.5.5. NO_2	4.2.5. Emissions	4.2. Em. & Emission Sources	4.3.1. TSP	4.3.2. SO_2	4.3.3. CO	4.3.4. HC	4.3.5. NO_2	4.3. Em. Reduction Needed	4. PROBLEM
(1)	Index																																															
(2)	Sub-Indices																																															
(3)	Indicators																													Indicators											Indicators						
(4)	Sub-Indi.							Sub-Indi.							Sub-Indi.							S/I				S/I									Sub-Indicators													
(Weights)	(50)	(0)	(0)	(0)	(50)	(0)	(25)	(50)	(0)	(0)	(0)	(50)	(0)	(25)	(50)	(0)	(0)	(0)	(50)	(0)	(25)	(50)	(0)	(50)	(25)	(50)	(0)	(50)	(0)	(50)	(30)	(10)	(10)	(10)	(20)	(20)	(20)	(20)	(20)	(40)	(50)						(C)	
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Fig. II-9e. Output Format #2, State Scores for Index 5

(1) Index (2) Sub-Indices (3) Indicators (4) Sub-Indi. (Weights) STATE	5.1.1. Unknown Sources (20)	5.1.2. Non-Complying Sources Not on Compl. Schedule (20)	5.1.3. Overdue Sources (30)	5.1.4. Sources That Require Field Surveillance (30)	5.1. Source Compliance & Enforcement (40)	5.2.1.1. # of Stations Needed (30)	5.2.1.2. # of AQCRs with Less Than Required Network (30)	5.2.1.3. Improvement Needed in Sufficiency Score (40)	5.2.1. TSP (17.5)	5.2.2.1. # of Stations Needed (30)	5.2.2.2. # of AQCRs With Less Than Required Network (30)	5.2.2.3. Improvement Needed in Sufficiency Score (40)	5.2.2. SO_2 (17.5)	5.2.3.1. # of Stations Needed (30)	5.2.3.2. # of AQCRs with Less Than Required Network (30)	5.2.3.3. Improvement Needed in Sufficiency Score (40)	5.2.3. CO (17.5)
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(1) Index (2) Sub-Indices (3) Indicators (4) Sub-Indi. (Weights) STATE	5.2.4.1. # of Stations Needed (30)	5.2.4.2. # of AQCRs With Less Than Required Network (30)	5.2.4.3. Improvement Needed in Sufficiency Score (40)	5.2.4. O_x (17.5)	5.2.5.1. # of Stations Needed (30)	5.2.5.2. # of AQCRs With Less Than Required Network (30)	5.2.5.3. Improvement Needed in Sufficiency Score (40)	5.2.5. NO_2 (0)	5.2.6.1. Sources on SEDS Verification File (50)	5.2.6.2. Missing NEDS Data Items (50)	5.2.6. Emissions Reporting (30)	5.2. Monitoring & Reporting (30)	5.3.1. Needed SIP Portions (100)	5.3. Completing Plans & Revisions (30)	5. OPERATIONAL REQUIREMENTS
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Fig. II-10. Output Format #2, State Scores for All Indices and Sub-Indices

	(1)	Indices																						
	(2)	Sub-Indices						Sub-Indices					Sub-Indices				Sub-Indices				Sub-Indices			
		(25)	(25)	(25)	(25)	(0)		(30)	(20)	(20)	(30)		(40)	(30)	(30)		(35)	(30)	(35)		(40)	(40)	(30)	
STATE		1.1. TSP	1.2. SO_2	1.3. CO	1.4. O_x	1.5. NO_2	1. GOAL ATTAINMENT	2.1. MBO Commitments	2.2. Source Compl.	2.3. Surveillance & Enf. Actions	2.4. Monit. & Rptg.	2. PROGRESS	3.1. Source Compl.	3.2. Monit. & Rptg.	3.3. Completing Plans	3. ACHIEVEMENT	4.1. AAQ Problem	4.2. Emissions & Em. Sources	4.3. E.R. Needed (Poll.-Specific)	4. PROBLEM	5.1. Source Compl. & Enf.	5.2. Monit. & Rptg.	5.3. Completing Plans	5. OPERATIONAL REQUIREMENTS
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	(2)																							
	(1)																							
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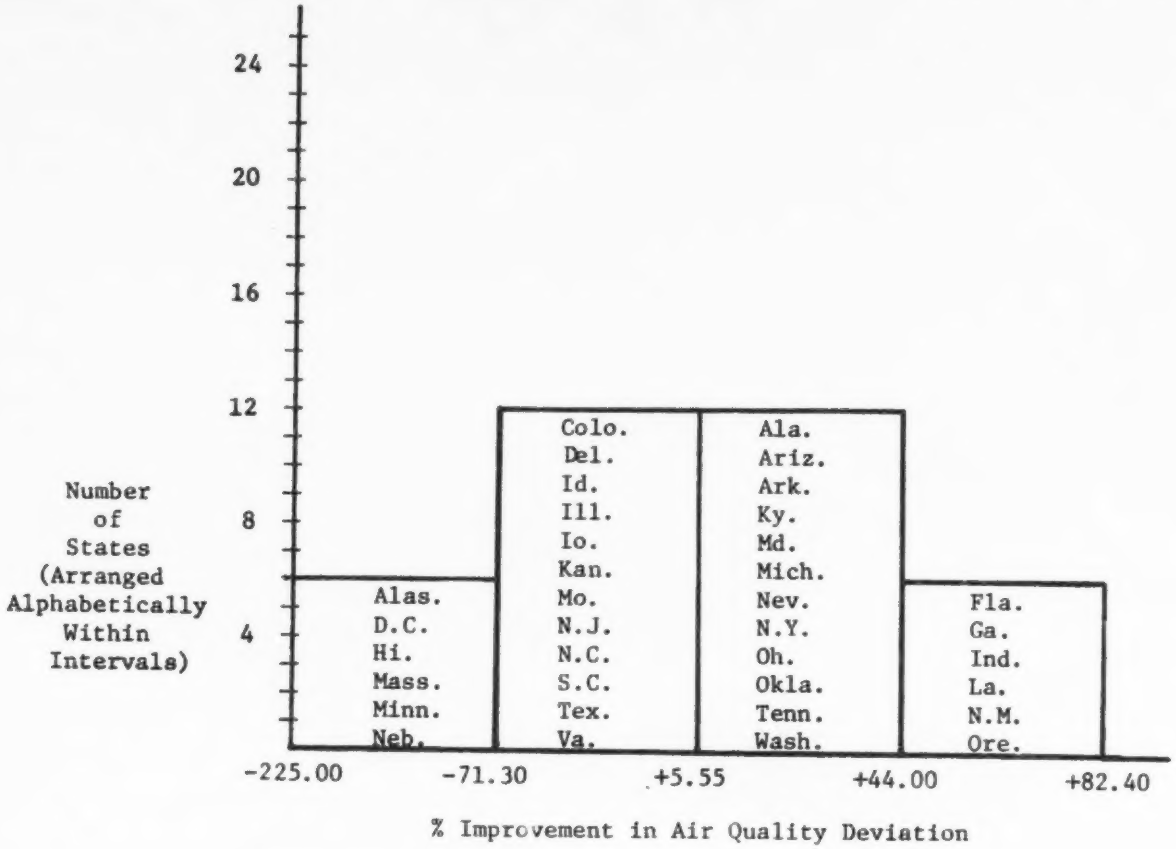
within each index in parentheses at the top of the column. The index scores for each state are given on line (1), and sub-index scores on line (2).

(3) Output format #3 shows a frequency distribution of the number of states that had computed values or scores within designated intervals, for any given sub-indicator, indicator, sub-index, or index. Within this distribution states falling into each interval can be identified.

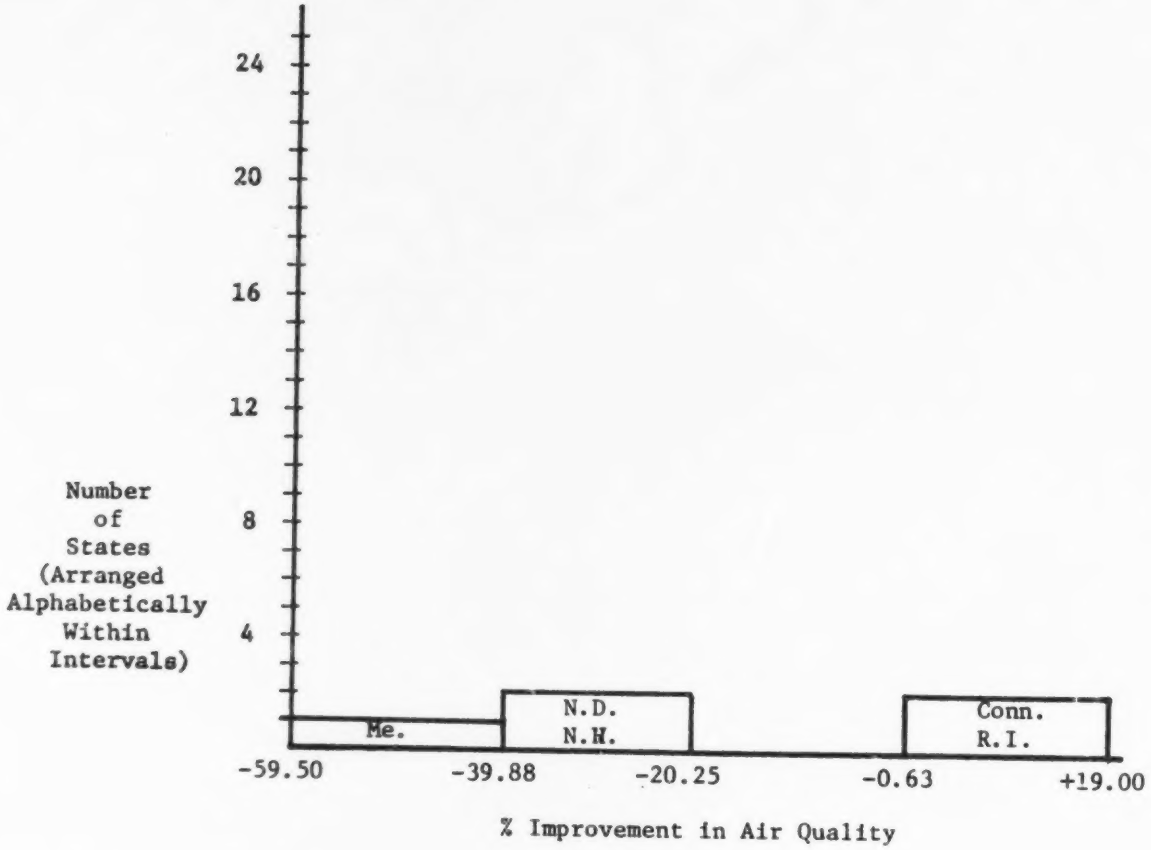
Figures II-11a to II-11g give the frequency distributions of all states in the trial run for a sample of measures (sub-indicators 1.1.1.1.(a) and 1.1.1.1.(b), indicators 1.1.1., 1.1.2., 1.1.3., sub-index 1.1., and index 1).



Values for Sub-Indicator 1.1.1.1.(a) TSP AQ Deviation Improvement
(>Annual Standard)

(Geometric Scale)

Fig. II-11a. Format #3, Frequency Distribution



Values for Sub-Indicator 1.1.1.1.(b) TSP AQ Improvement
(≤Annual Standard)

(Arithmetic Scale)

Fig. II-11b. Format #3, Frequency Distribution

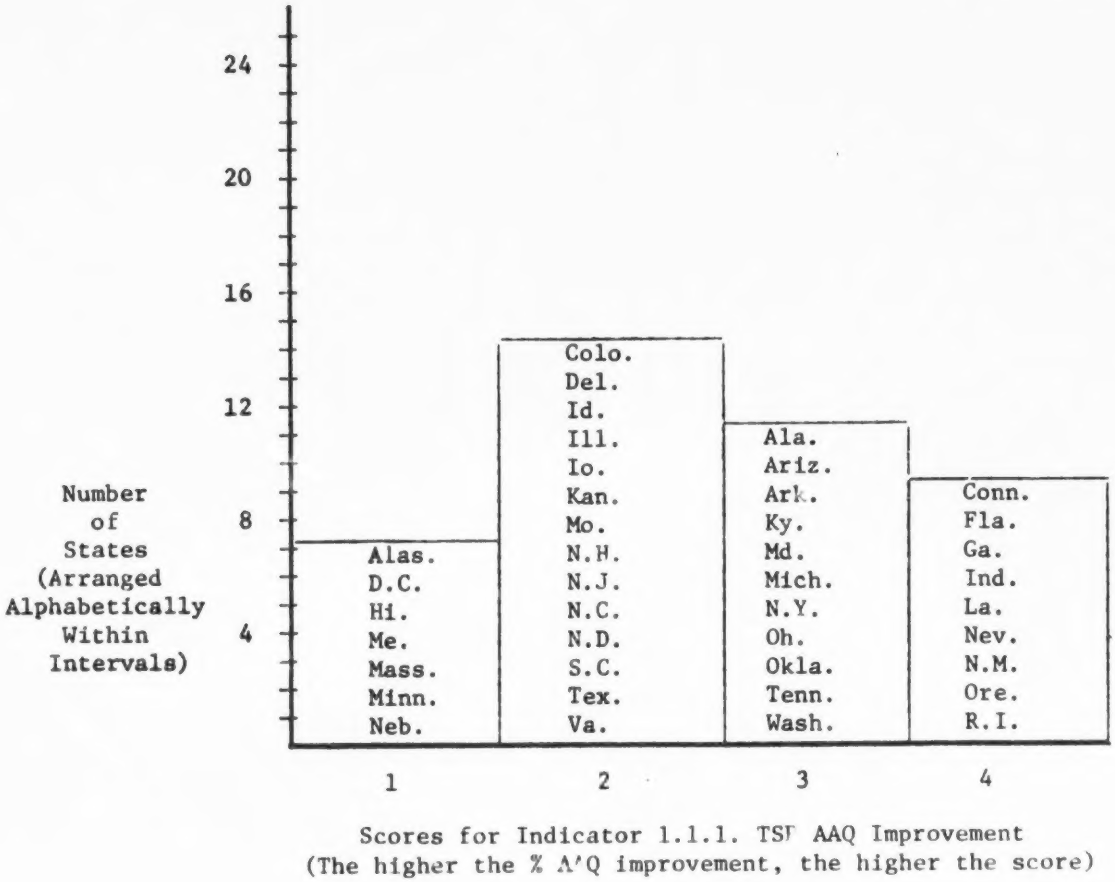
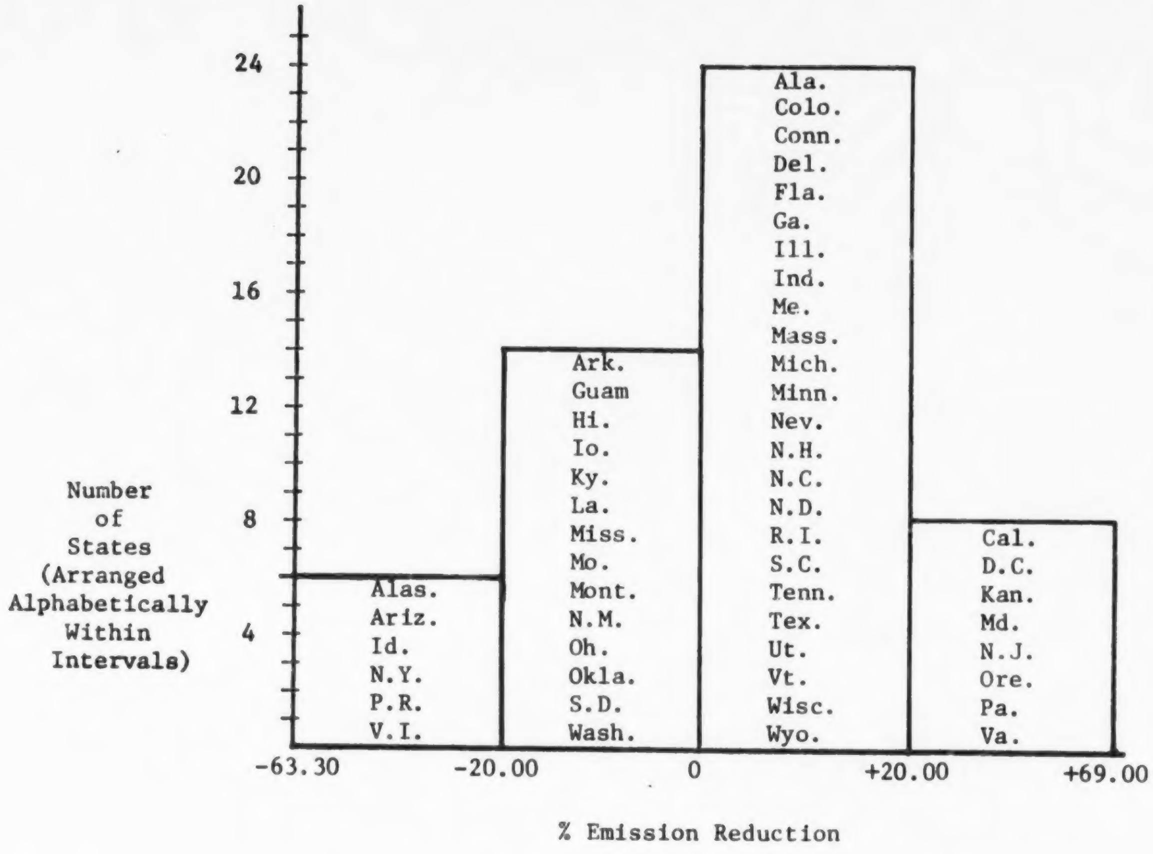
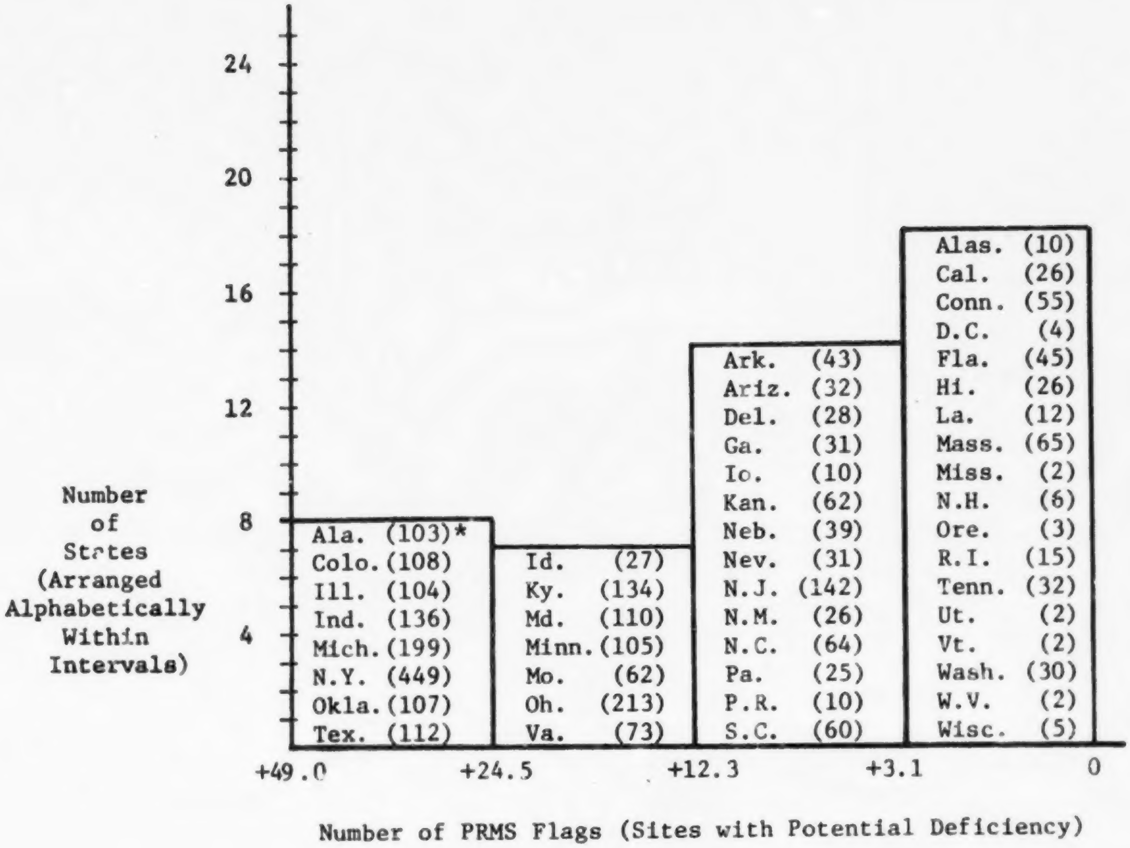


Fig. II-11c. Format #3, Frequency Distribution



Values for Indicator 1.1.2. TSP % Emission Reduction

Fig. II-11d. Format #3, Frequency Distribution



Values for Indicator 1.1.3. TSP PRMS Flags
(Annual and 24-Hour Standards)

(Geometric Scale)

* Number of stations in each state with sufficient data for PRMS analysis are in parentheses.

Fig. II-11e. Format #3, Frequency Distribution

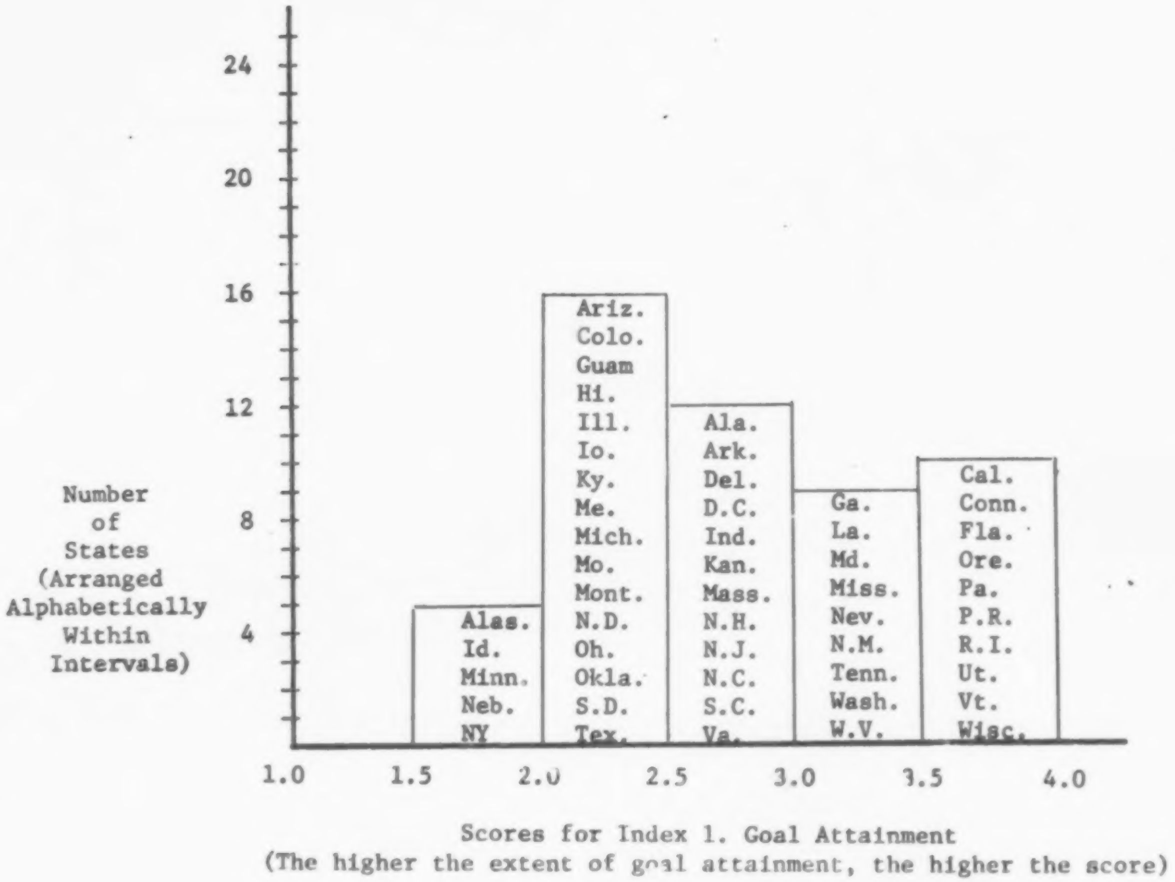


Fig. II-11f. Format #3, Frequency Distribution

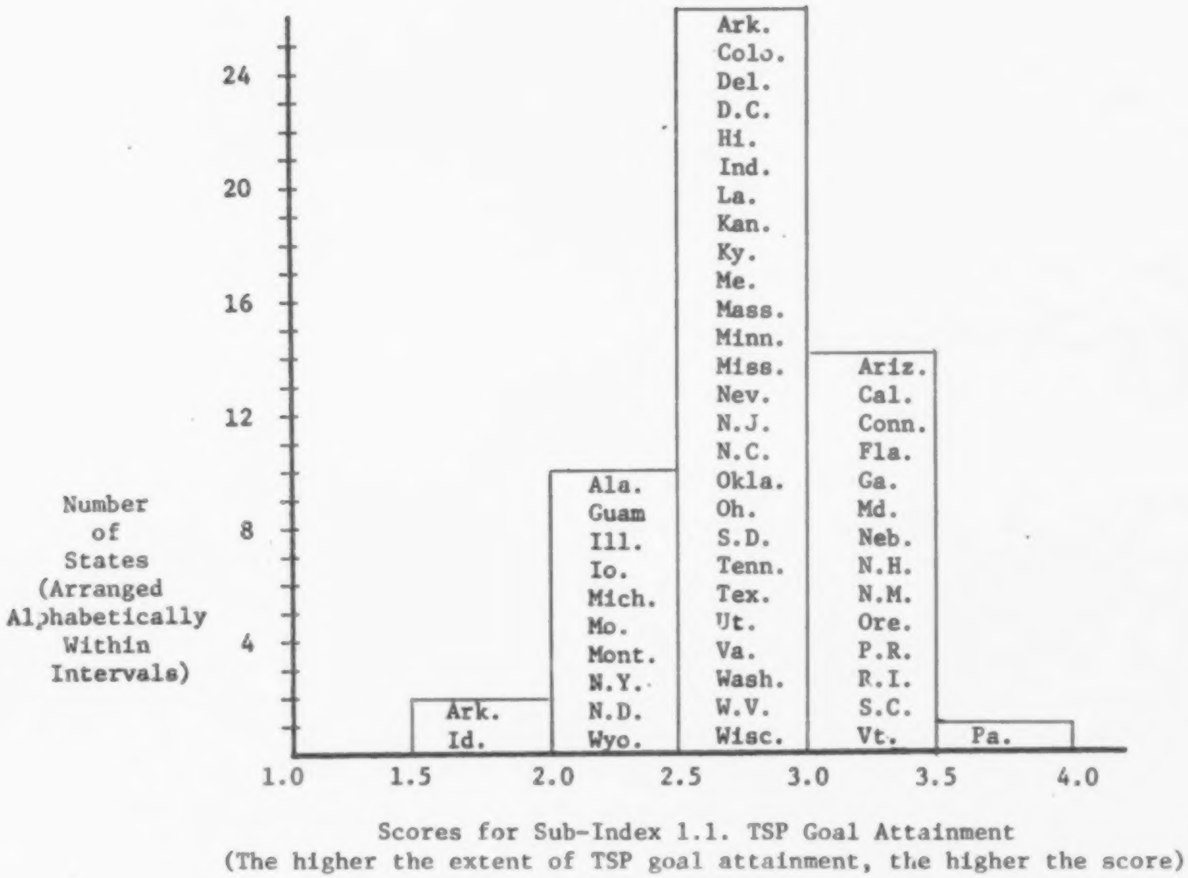


Fig. II-11g. Format #3, Frequency Distribution

E. Issues and Problems

1. Uses of the System

An important question regarding the system is the use(s) to which the results of the system are put. Possible uses to which system results can and cannot be put are discussed here.

A word first on what the system is not intended to be. Because the measures used in the system were developed on the basis of data from existing reporting systems currently or soon to be available to EPA headquarters, the system is not intended to be a comprehensive evaluation of any state. In fact, it is well recognized that such a comprehensive evaluation needs two things which this system lacks:

(1) Additional and more detailed information than is available from existing data systems at EPA headquarters. Because of the constraint of using existing data systems available to EPA headquarters, there are important aspects of control activities or need that are not treated simply because there are no data routinely available at headquarters.

(2) Judgment by EPA staff at the regional office level familiar with the particular problems and unique circumstances facing an individual state, needed to interpret and put into perspective the numbers generated by the system. Numbers alone can be misleading because of errors in data collection and processing, because of extenuating or unique circumstances, because of unforeseeable difficulties or any of a number of other reasons. Indeed, the results of the system, whatever the uses to which they are put, should be used in light of

interpretive comments and explanations from knowledgeable regional personnel.

On the other hand, numbers can shed light on the air pollution control situation and can indicate trends and problem areas. The system described in this report is one way of consolidating, organizing, summarizing, and presenting in a coherent framework the enormous amounts of data routinely reported to EPA headquarters. It provides an overall view of state control performance and need, and makes explicit the relative importance of the various program areas and aspects considered.

The system can be implemented by headquarters or regional office personnel for any group of states (all states in the country, all states in a region, states sharing certain characteristics, etc.). The individual measures and the evaluation framework can be used for an individual state, although the scoring, weighting, and aggregation procedures were designed to enable some comparisons among states. The system can be implemented at regular time intervals to allow assessment of trends, rates of improvement, and changes in relative standings.

The system can be used as a:

(a) Method of painting a broad picture of national status and trends in selected air pollution control program areas, pointing out problem areas, and quantifying deficiencies. Results can be one input into setting priorities for program planning, and allocating resources among program areas.

(b) Method of ascertaining state status within a national picture and indicating the geographical distribution of problems. Results can be one input into setting priorities and allocating resources among geographical areas.

(c) Flagging mechanism to point out to EPA headquarters possible program areas needing additional investigation with regard to nationwide air pollution control performance and need, and to EPA regional offices and states with regard to state progress within national efforts and trends.

(d) Method for feedback conerning the validity and efficiency of EPA information systems and reporting requirements, and problems regarding data collection procedures, definitions of terms, and data flows.

2. Data Base

The results of the system are only as good as the data from which they are derived. During the development of the system data items and data systems were evaluated as to the validity. accessibility, completeness, timeliness, and stability of the data. These criteria and general findings are discussed in Volume 1, Section B.

With the development of the system and the trial run completed, several questions and problems relating to the data base remain, and deserve discussion:

(a) Data Validity: There was general agreement among all EPA personnel involved that data: (1) were not as "hard" as was desired, (2) would improve in validity in the future with additional EPA clarification and guidance, and increased state and local experience, (3) had to be used because there were no other data with a higher degree of validity, and (4) should be used carefully with their validity limitations firmly in mind.

(b) Data Availability and Completeness: Varying amounts of data are available from the states. Since calculation of values of the measures depends on the existence of data, this means that for many measures there will be some states for which values cannot be computed because of the lack of data. For these states weights for other component measures must be reallocated. This situation can be expected to improve in regard to data required of all states.

In addition, even where there is some data available and values can be computed, the varying amounts of data available for the states affect the computed values and scores. Thus a state that submits little air quality or emissions data relative to what should be submitted will show less air pollution or emissions than should actually be shown. This problem is sometimes addressed to some degree, e.g., by the use of a correction factor for air quality deviation or by showing how many sites in relation to minimum required numbers were analyzed by PRMS. Also, scores for any air quality deviation or emissions measure for a state should be looked at in light of the state monitoring and reporting score.

(c) Data Timeliness: Some data, such as data in NEDS and SAROAD, are subject to considerable time delay. Even if states and regions meet all reporting deadlines, there is a significant lag between the time for which data are relevant and the time data are available at headquarters. Thus areas recognized as problems as a result of implementing the system may have already been improved in the intervening time between data collection and implementation of the system. (This is less of a problem for MBO outputs data.)

Some improvement on this point is possible (witness the proposal for the establishment of AAQ trend stations for which data would be available much more quickly). However, this will probably continue to be a problem, making it even more important to obtain comments from regional personnel familiar with the current situation in a state.

(d) Varying Time Periods: The time lag between data collection and availability varies for different data systems and data items. For example, NEDS data currently available from NADB are generally representative of calendar year 1973 and early 1974, while MBO data for the second quarter of FY75 are available. This is not considered a significant problem as long as data applicable to different time periods are not combined within an individual measure. Also, if two or more states are to be compared, the same time periods should be used for all states.

3. Weighting System

The system is designed to facilitate assignment of weights by the user to accommodate the user's priorities and subjective judgment. In fact, the second step of the methodology involves setting the weights.

There are two reasons that weights may vary. First, it may be desirable to weight some measures, especially pollutant-related measures such as monitoring and reporting for each pollutant, according to the severity of the problem for each pollutant. Thus for one state with a severe oxidant problem and less severe problems with the other pollutants, measures for the monitoring of oxidants may be weighted much more heavily than the measures for monitoring the other pollutants. Weights for HC emissions, population exposed to O_x air quality deviation, and population growth rate may also be relatively larger than those for other emissions, population exposed to other pollutants, and manufacturing growth rate, respectively. In this case, certain weights may vary from state to state according to a predetermined scale relating severity of problem to weights of measures.

Second, weights for certain measures, especially those related to separate program areas, vary according to priorities. For example, a regional office may assign weights for source compliance, monitoring, and completing plans and revisions according to the relative priority of these program areas. However, if the regional office is implementing the system for all its states and is interested in comparing its states, weights relating to relative priorities should not vary from state to state. If priorities change and the system is implemented another time, these weights can be altered accordingly.

One additional problem in weighting measures relates to a point mentioned earlier in discussing data availability. If the value of a particular measure cannot be computed for a particular state either (a) the state must be given a score of 0 with the same weight for that component as is applied for the other states being compared, or (b) the weights for that state must be reassigned to the remaining components for which values can be computed, in the same proportions as the original weights. The consequences of each alternative are illustrated below:

> A given indicator is composed of three sub-indicators, each with a weight of 1/3. State A has sufficient data for

all three sub-indicators and scores of 2, 3, and 1 are computed, while for state B values for only two of the three sub-indicators can be computed and the scores for these are the same as for state A, i.e., 2 and 3. Under alternative (a) the scores for the indicator are:

State A: $(2)(1/3) + (3)(1/3) + (1)(1/3) = 2$

State B: $(2)(1/3) + (3)(1/3) + (0)(1/3) = 1\ 2/3$

Under alternative (b) the scores are:

State A: $(2)(1/3) + (3)(1/3) + (1)(1/3) = 2$

State B: $(2)(1/2) + (3)(1/2) = 2\ 1/2$.

There are two reasons that values for a particular measure for a state cannot be computed:

(1) For some measures, no value need be computed. For example, progress in adding needed stations is not computed if no stations are needed. Or, ambient air quality values for a particular pollutant are not reported if a state is not re-required by federal regulations to maintain a station for that pollutant.

(2) Data that is required of a state is not reported to EPA headquarters. For example, a state required to have a number of stations for a given pollutant reports no ambient air quality data.

It was felt that a state should not be penalized if a value was not computed for the first reason. Therefore alternative (a) was appropriate in these cases. If a value for a particular measure could not be computed for the second reason, it was felt that no conclusion could be made about state status in regard to the measure. Moreover, the failure to report required data would be reflected in a state's scores for the reporting measures. Once again alternative (a) was considered appropriate. Thus, it was decided that in all cases where a value for a measure could not be computed, weights would be reallocated among the remaining components,maintaining the same proportions among the weights of these remaining components as existed originally.

4. System Flexibility

A concerted attempt was made to make the system flexible in order to meet as many user needs as possible. It is recognized that different users of the system will be interested in different indicators and different levels of aggregation. Therefore the system is structured to allow presentation of results at various levels of aggregation and in different formats. It is possible to use the framework of measures to compute values for sub-indicators and indicators without converting values to scores and weighting and aggregating scores to obtain scores at higher levels of aggregation.

5. Feasibility of Automation

Due to the nature of this objective system and its total reliance on information systems already automated for other purposes, the potential exists for expansion to a 100% automated, quick turnaround system complete with periodic updates, generation of reports, and other features of computerized management information systems. The purposes of this section are to point out the numerous factors which determine the costs and benefits of such a system as well as its manual counterpart and other alternative approaches, and to make recommendations based on the importance of these factors to the system objectives.

This study was not intended to be a complete, in-depth analysis of the costs and benefits, or the impact of the system on its users. It is solely a preliminary study which, though not totally unconcerned with detail, does concentrate on major points and can be of benefit in narrowing down the possible approaches and in deciding upon the final method for long term system use.

Some of the factors which are considered in the cost-benefit analysis of the approaches are the following:

-- frequency of update

-- system utility-user access requirements

-- need for flexibility

-- probability of major system modification

-- linkages among existing automated systems

-- accuracy of calculations

-- lag time in data flow

-- manpower needed-developmental and operational

-- hardware and software needed.

These factors are used as a basis for analyzing three alternative approaches: (1) continuation of manual preparation, (2) complete automation, and (3) partial automation. Manual preparation is defined as any method of data reduction and analysis using no computer support other than a desk model calculator or programmable calculator. Complete automation is defined as the method which minimizes human contact with the data by allowing all current information systems to feed into another system which automatically calculates the necessary indices and generates the correct user-requested report. Partially automated refers to the automation of specific aspects of the system which may be more amenable to automation than others.

The three approaches to automation are discussed below.

(a) Complete Automation: The complete automation of the system would require a large scale effort, one for which the hardware is not totally available at the present time (linkage between CDS and AEROS computer facilities is planned but not currently functional). Information must be assembled from a variety of existing systems, and indices must be calculated. Two distinct computer facilities are involved, one at OSI in Bethesda, Md., and the other at Research Triangle Park, N.C. The coordination and retrievals from the various data files may be an expensive and time-consuming task.

The data bases involved in the evaluation system include SAROAD, NEDS, CDS, and EPA Formal Reporting System, as well as supplementary bases such as PRMS. The assemblage of these data for use in an automated system would require the creation of special tapes from each system with the required information and subsequent processing of the data. This process would have to take place at appropriate update times.

The advantages of automation are its accuracy, speed, and quick turnaround. Operational costs are minimized if program modifications are not extensive. Users therefore do not have to wait, and reports are generated upon request. The quick response allows for some experimentation with varied weighting factors and their bearing on the final outcome. It also means that the data used are the most recent. It is not necessary to wait for data tabulations or reports to be published.

The primary drawbacks of a completely automated system are its lack of flexibility and its high initial cost in program development. If the system is fairly stable over time, and it is to be used for many years in a similar way, the high initial costs are amortized and the system will begin to pay for itself. In the case of the state status system, with expected yearly modifications to system parameters, constants, and possibly even reports, operational costs of program modification would greatly extend the amortization period.

(b) Manual Preparation: The method currently used to prepare the data is 100% manual. Data are collected in hard copy forms from reports generated by existing automated systems, required reports (SIP Progress Report, Trends Report) and other reports intended for other purposes (Quarterly AEROS Status Report).

Data needed for index calculation are extracted and, using appropriate weighting factors, indices are calculated with the assistance of preprinted calculation forms. The test run of this method for all states required approximately 328 hours of calculation. Future number of hours necessary to complete one update will depend upon expansion or contraction of numbers of indices and the potential availability of data which are currently required but are not currently being reported.

There are a number of distinct advantages in this approach. The main one is its adaptability to changing indices, changing weights, or variations in methods of calculation. The method can be varied in any manner to suit the analyst's requirements without a need for additional updating expense. Also, since it uses existing hard-copy output, no expense is incurred by having to create data tapes, coordinate their acquisition, or write programs to read them into the computer. Another advantage is that highly trained manpower is not needed to operate the system. With detailed instructions and calculation sheets, the data preparation phase can be completed by anyone knowledgeable in arithmetic and the use of a calculator.

The manual method also has its disadvantages. It is time-consuming. If an analyst would like to determine the effect of changing some weights or input parameters, he or she must wait the time necessary to recalculate indicators or indices. Sacrifice in accuracy is a major disadvantage of any manual, repetitive data reduction operation. The effects can be ameliorated to some extent by establishing a relatively modest quality control or sampling procedure looking particularly at expected ranges of values or recalculating a random sample of necessary calculations.

There is an additional problem of lag time in data collection because some period of time must elapse before some reports are published. At the present time, this would mean that two-year old data are being analyzed, and the index calculated is historical rather than current. For example, the 1972 Trends Report was published in mid-1974.

(c) Partial Automation: This method would result in specific aspects of the process being automated, those aspects which are easiest and least costly to automate. Selection of the items or sets of items will necessarily be those which require little developmental programming or coordination of data bases. In fact, those portions deemed advisable to be automated might include only the calculations, or it might include only those items which are derivable from one existing system, such as CDS-based indices.

This method would also combine to some extent the benefits of both the approaches previously mentioned as well as minimizing costs. Less time would be required to obtain output, resulting in increased user access. Flexibility would be retained so that minor system modifications would be easily assimilated and major modifications would not be excessively burdensome in terms of manpower.

The problem of establishing linkages among existing systems would be avoided and high accuracy would be maintained. The problems of lag time would not be avoided, except for the cases in which the automated items include those which have the longest lag time. For example, if SAROAD data are automatically entered into the system, then the lag time associated with waiting for the most recent Trends Report will be eliminated. However, since the evaluation is being done for one period in time, that period must correspond to the one for which most data are available. Thus having up-to-the-minute data will not be useful if the majority of data are not up-to-date.

The dependence on the computer and some software will require the updates to be done by someone knowledgeable in electronic data processing, particularly if any modifications need to be made. The shorter time required for the update calculation and the increased accuracy will, however, most likely balance out the need for higher quality manpower.

Conclusions concerning the alternatives are:

(1) Complete automation should not be considered at this time. The problems of complete automation are too extensive at the present time to recommend this approach. The resource expenditures necessary would not be justified particularly due to the planned infrequent updates and input parameter instability. A major reprogramming effort might be necessary after each period to adjust the input parameters according to air programs needs.

If, at some later date, the system is used more frequently, stability is more prevalent, and systems coordination are enhanced, a further study into its feasibility would be warranted. At that time specific cost elements could be detailed and weighed against system benefits. Until such time, one of the other alternatives should be considered as currently more cost-beneficial.

(2) A manual system should be used if the degree of system usage is low and/or the degree of expected modification is high. To minimize costs, no attempt should be made to automate the system if one or both of the two most important considerations do not favor it. The two considerations are:

(a) The intended usage rate of the system: Since the developed system has only been used for one trial run and further experiments, trial runs, and other testing efforts are needed before full implementation of the system is possible, it is not now known how widespread the application of the system will be. If the system has only a limited appeal and is rejected by many potential users then the costs of its development and operations should be low. If, on the other hand, support for its use are widespread and frequent queries are made of it, then extra costs would be warranted. The measure of future applicability is then the most important consideration in the determination of the extent of system automation.

(b) The uncertainty of system parameter stability: Air programs in the various federal regions and states within regions are necessarily dynamic. The data outputs from states must reflect this changing situation and changing priority scales. Data items to be reported may thereby vary from one year to the next, the constant ones being emissions and air quality data. Thus, it is impossible to assume that any one data item will be reported year after year. Since automation requires some consistency in data input, system stability and resistance to major modification is a very important consideration in choosing an approach to systems update.

(3) The compromise solution of partial automation is the logical approach if the factors do not weigh heavily in one direction or the other. Those portions of the system most readily automated could make up the semi-automated system. Further study would have to be done to determine which aspects are most easily automated. Preliminary investigation reveals that the aspects to be likely candidates are those which are derivable from the SAROAD, NEDS, or CDS files. Calculations would then be done on data from any one file to put them in the correct reporting format. For example, a simple program could be written to scan the SAROAD data base and calculate the air quality deviation indication and air quality improvement measure for all states, without having to rely on hard copy reports.

APPENDIX II-A. DATA SOURCES

A list and brief description of the sources of data from which indicator values are computed are presented below.

I. EPA Data Sources

A. Aerometric and Emissions Reporting System (AEROS): data bank maintained by the National Air Data Branch (NADB) in Durham, N.C.

1. Storage and Retrieval of Aerometric Data (SAROAD): ambient air quality portion of AEROS records all measurements of ambient air concentrations of the criteria pollutants submitted by state and local agencies. States are required to submit data to EPA Regional Offices quarterly within 45 days of the end of quarter; the data is supposed to be in SAROAD within 75 days of the end of the quarter. Computer printouts can be obtained at any time (subject to specific requesting procedures) of specified data in SAROAD (raw data, frequency report, standards report, parameter file, summary file). Regular publications based on SAROAD are:

a. Monitoring and Trends Report (annual) discusses trends in AAQ and completion of state monitoring networks, and includes summary data as compared with NAAQS for all criteria pollutants, states, AQCRs, and monitoring sites reporting data meeting minimum SAROAD sufficiency criteria (minimum sufficiency for 24-hour integrating samples is 5 values per quarter distributed over at least 2 of the 3 months of the quarters with at least 2 samples in each of the 2 months if there is no sample in the third month, and for continuous instruments 75% of the possible hourly values for annual summaries).

b. Air Quality Data (quarterly and annual) shows frequency distributions for all data reported to SAROAD (not subject to sufficiency criteria) by criteria pollutant, state, AQCR, and monitoring site.

2. National Emissions Data System (NEDS): emissions portion of AEROS contains information on emissions of criteria pollutants, emission factors, fuel consumption, and point and area sources. States are required to submit to EPA Regional Offices semi-annually information on new sources and certain changes in existing sources within 45 days of the end of the semi-annual report period; the data is supposed to be in NEDS within 75 days of the end of the period. In addition to computer printouts obtainable at any time, NEDS publishes: National Emissions Report (annual) which lists emissions, totals and by emission source categories, for the country, every state and every AQCR.

3. AEROS Status Report contains reports on missing data items of the NEDS point source inventory, status of AEROS/NEDS validation efforts, status of emission factors improvements, summary of SAROAD monitoring activity, and summary of valid data reported to SAROAD. (Report is currently not being published regularly, but program is available to generate reports on request.)

B. Management-by-Objectives (MBO) System: EPA's Formal Planning and Reporting System which, starting in FY75 provided for a system of negotiation of output commitments with states in all media programs and periodic reporting of output achievements. MBO Air Programs Outputs #2 through #8 do not require breakdowns of commitments and achievements by states. Output #1, dealing with source compliance, is reported quarterly by state, to EPA's Division of Stationary Source Enforcement (DSSE) in Washington, D.C. and summarized in a State Activity Report.

C. Plan Revision Management System (PRMS): system developed by the EPA Office of AQPS to assist regional offices in making evaluation of plan adequacy; identifies AQCR's with potentially deficient SIPs, by comparing measured AQ values at each monitoring site with predicted AQ values for that site projected from applicable SIP regulations, expected growth, source compliance status, TCPs and automotive emission standards to determine whether adequate progress has been made toward attainment of standards. PRMS has made 3 analyses thus far, expanding its latest analysis to 117 AQCRs (approximately 6000 sites) and all criteria pollutants except NO_2. It is hoped that eventually PRMS analyses will be made after every quarterly SAROAD update.

The PRMS Analytical Summary Report consists of 11 volumes, 1 volume for each region and a summary volume, and includes an analysis for each site found to be potentially deficient, a summary of analytical results for all sites, and a map of sites found to be potentially deficient.

D. State Air Pollution Implementation Plan Progress Report (semi-annual): report put out by OAQPS and OE that assess the progress made by states in implementing the Clean Air Act.

E. State Implementation Plan Automated Information System: recently automated data bank currently containing all regulations which are part of the SIP's. This system, developed for NADB, may eventually include other portions of the SIP's.

The following data sources are currently in the process of being made completely operational, and should be the source of additional information that may be useful to the system.

F. Compliance Data System (CDS): a Regional Office computerized enforcement management system designed to track source compliance schedule status, in various stages of completion in the Regional Offices. When operational in all regions, CDS can fill gaps in MBO source compliance information.

F. Manpower Model: a computer model being developed for OAQPS that will project manpower needs for various aspects of control agency activities. Used in conjunction with current manpower and budget information (totals are available in the semi-annual SIP Progress Report, but breakdowns by type of activity are not now available), such information can provide some measure of how well state agencies are meeting resource needs.

II. Non-EPA Data Sources

A. U.S. Bureau of the Census, Department of Commerce

1. U.S. Decennial Census, Population Report (1970).
2. Statistical Abstract of the U.S. (annual): abstract of information derived from the Census and other sources.
3. U.S. County and City Data Book (annual): selected information for all U.S. cities and counties derived from the census and other sources.

B. National Weather Service, National Oceanic and Atmospheric Agency, Department of Commerce, Climatological Data: monthly and annual summaries of selected climatological information for the nation, states and possessions, divisions of states, and individual weather stations.

C. The 1972 OBERS Projections: Economic Activity in the U.S.: historical and projected (1929-2020) data by BEA economic area, water resources region and subarea, states, SMSAs, and AQCRs, prepared by the Bureau of Economic Analysis (Commerce Department) and Economic Research Service (Dept. of Agriculture); information is given on population, employment, personal income, earnings, and indexes of production by industry categories.

D. Dun and Bradstreet, Dun's Market Identifiers: computerized file of industrial facilities, to which EPA subscribes for an annual update, that includes summaries of the number of establishments by category and by state and other geographical units.

APPENDIX II-B

REVISED

1972/1973 Pollutant-Method-Stations Summary

Pollutant		Code	Method	1972 No. of Stations	1972 Percent of Total	1973 No. of Stations	1973 Percent of Total	Approved	Unapproved	Unacceptable[b]
TSP	11101	91	Hi-Vol (FRM)[a]	2828	100	3602	100	X		
CO	42101	11	NDIR (FRM)	223	99	278	96	X		
		12	Coulometric	1	0	2	0			X
		21	Flame Ionization	2	1	10	4		X	
				226	100	290	100			
SO_2	42401	11	Colorimetric	68	5	89	5		X	
		13	Conductimetric	80	7	108	6		X	
		14	Coulometric	76	6	172	9		X	
		15	Autometer[c]	1	0	1	0		X[c]	
		16	Flame Photometric	12	0	29	1		X	
		31	Hydrogen Peroxide[c]	38	3	38	2		X[c]	
		33	Sequential Conductimetric	3	0	6	0		X	
		91	West-Gaeke-Sulfamic Acid (FRM)	1040	76	1510	77	X		
		92	West-Gaeke Bubbler	45	3	11	0			X
		93	Conductimetric Bubbler	2	0	0	0			X
				1365	100	1964	100			
NO_2	42602	11	Colorimetric	110	12	136	8		X	
		12	Colorimetric	15	1	14	1		X	
		13	Coulometric	5	0	10	1		X	
		14	Chemiluminescence	36	3	8	0		X	
		71	J-H Bubbler (orifice)	11	1	14	1			X
		72	Saltzman	11	1	5	0			X
		84	Sodium Arsenite (orifice)	5	0	26	1		X	
		91	J-H Bubbler (frit)	816	79	995	60			X
		94	Sodium Arsenite (frit)	28	3	456	28		X	
		95	TEA						X	
		96	TGS						X	
				1037	100	1664	100			
Photochemical O_x (Oxone)	44101	11	Alkaline KI Instrumental	49	13	10	2			X
		13	Coulometric[d]	10	3	10	2		X[d]	
		14	Neut KI Colorimetric	75	21	89	21		X	
		15	Coulometric	13	4	22	5		X	
		51	Phenolphthalin	5	1	3	1			X
		81	Alkaline KI Bubbler	64	18	79	18			X
		82	Ferrous Oxidation	85	23	91	21			X
	44201	11	Chemiluminescence (FRM)	62	17	131	30	X		
		13	Coulometric[d]	1	0	1	0		X[d]	
				364	100	436	100			

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[a] FRM = Federal Reference Method.

[b] See Appendix B for an explanation of why these methods are unacceptable.

[c] These methods should be reported under method code 42401 13.

[d] These methods should be under method code 44101 15.

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APPENDIX II-C

SUMMARY OF NATIONAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING TIME	PRIMARY STANDARDS	SECONDARY STANDARDS	FEDERAL REFERENCE METHOD (FRM)	COMMENTS
PARTICULATE MATTER	Annual (Geometric Mean) 24 - Hour*	75 $\mu g/m^3$ 260 $\mu g/m^3$	60 $\mu g/m^3$ 150 $\mu g/m^3$	Hi-Volume Sampler	The secondary annual standard (60 $\mu g/m^3$) is a guide for assessing SIPs to achieve the 24-hour secondary standard.
SULFUR OXIDES	Annual (Arithmetic Mean) 24 - Hour* 3 - Hour*	80 $\mu g/m^3$ (0.03ppm) 365 $\mu g/m^3$ (0.14ppm) ——	—— —— 1300 $\mu g/m^3$ (0.5ppm)	Pararosaniline	
CO	8 - Hour* 1 - Hour*	10 mg/m^3 (9ppm) 40 mg/m^3 (35ppm)	(Same as Primary)	Non-Dispersive Infrared Spectrometry	
NO_2	Annual (Arithmetic Mean)	100 $\mu g/m^3$ (0.05ppm)	(Same as Primary)	Jacobs-Hochheiser (Rescinded)	The continuous Saltzman, Sodium Arsenite (Christie), TGS, and Chemiluminescence have been proposed as replacements for the J-H method. New FRM to be decided upon by Jan. 1975.
PHOTOCHEMICAL OXIDANTS	1 - Hour*	160 $\mu g/m^3$ (0.08ppm)	(Same as Primary)	Chemiluminescence	The FRM measures O_3 (ozone)
HYDROCARBONS (Non-Methane)	3 - Hour* (6 to 9 a.m.)	160 $\mu g/m^3$ (0.24ppm)	(Same as Primary)	Flame Ionization	The HC standard is a guide to devising SIPs to achieve the Oxidant standard. The HC standard does not have to be met if the oxidant standard is met.

*Not to be exceeded more than once per year.

NOTE: The air quality standards and a description of the reference methods were published on April 30, 1971 in 42 CFR 410, recodified to 40 CFR 50 on November 25, 1972.

January 30, 1974 - JDC

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APPENDIX II-D

STATE BACKGROUND INFORMATION

1. Total population: (a) Civilian (County-City Data Book)
(1000) (b) Including military (Statistical Abstract of the U.S.)

2. Projected population, 1980: (a) Series C
(1000) (b) Series E.

3. Urban population (1000) = pop. in urbanized areas + places of 2500 and more.

4. Percentage of population that is urban.

5. SMSA population (1000).

6. Percentage of population that is in SMSAs.

7. Urbanized area population = pop. of densely settled areas of SMSAs (1000).

8. Total land area (sq. mi.).

9. SMSA land area (sq. mi.).

10. Overall density = total pop./total land area.

11. SMSA density = SMSA pop./SMSA land area.

12. # of AQCRs of priority I (sum over all pollutants).

13. Population in AQCRs of priority I (sum over all pollutants) (1000).

14. Total air pollution control agency expenditures ($1000), FY 73(SIP Prog. Rpt.)

15. Total expenditures/total population.

16. Total expenditures/urban population.

17. Total expenditures/SMSA population.

18. Total expenditures/UA population.

19. Total expenditures/total land area.

20. Total expenditures/SMSA land area.

21. Total expenditures/overall land density.

22. Total expenditures/SMSA density.

23. Total expenditures/population in AQCRs of priority I (sum over all pollutants).

24. Percentage deviation of 1973 heating degree-days from 30-yr. Normal $\left(\frac{\text{Avg.-Normal}}{\text{Normal}}\right)$ (averaged over all weather stations in state).
(+ = higher heating degree-days = colder
− = lower heating degree-days = warmer than normal)

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	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Conn.	Delaware
1. (a)	3,444	300	1,770	1,923	19,958	2,207	3,031	548
(b)	3,452	304	1,792	1,929	20,016	2,222	3,039	550
2. (a)	3,657	365	2,228	2,107	24,865	2,708	3,645	674
(b)	3,565	352	2,164	2,052	24,226	2,636	3,551	655
3.	2,012	146	1,409	961	18,136	1,733	2,345	396
4.	58.4	48.8	79.5	50	90.9	78.7	77.3	72.1
5.	1,801	--	1,319	595	18,500	1,582	2,505	38.6
6.	52.3	--	74.5	30.9	92.7	71.7	82.6	70.4
7.	2,011	--	1,157	378	16,147	1,424	2,101	349
8.	50,708	566,432	113,417	51,945	156,361	103,766	4,862	1,982
9.	10,194	--	9,343	3,379	47,357	6,322	2,282	1,165
10.	68	1	16	37	128	21	624	277
11.	176	--	141	153	356	250	1,097	331
12.	8	3	9	2	14	5	4	4
13.	6,967	283	5,981	99	49,143*	4,283	10,268*	1,544
14.	1,236	364	1,196	341	22,215	1,546	2,301	404
15.	.35	1.21	.67	.17	1.11	.70	.75	.73
16.	.61	2.49	.84	.35	1.22	.89	.98	1.02
17.	.68	--	.90	.57	1.20	.97	.91	1.04
18.	.61	--	1.03	.90	1.37	1.08	1.09	1.15
19.	24	1	11	7	442	15	473	204
20.	121	--	128	101	469	245	1,975	347
21.	18,176	364,000	74,750	9,216	173,555	73,619	3,688	1,458
22.	7,023	--	8.482	2,229	62,402	6,184	2,098	1,221
23.	.17	1.28	.19	3.44	.45	.36	.22	.26
24.	-8.1	+2.8	+2.9	-6.3	-4.5	+3.7	-9.8	-15.7

* AQCR not along county lines.

** No counties; made up of townships.

	D.C.	Florida	Georgia	Hawaii	Idaho	Illinois	Indiana	Iowa
1.(a)	756	6,789	4,589	768	712	11,110	5,194	2,824
(b)	755	6,841	4,603	773	738	11,125	5,203	2,832
2.(a)	--	8,626	5,337	895	783	12,591	5,943	2,985
(b)	--	8,280	5,191	874	761	12,256	5,782	2,908
3.	757	5,468	2,768	639	385	9,230	3,372	1,616
4.	100	80.5	60.3	83	54.3	83.1	64.9	57.2
5.	757	4,657	2,280	629	112	8,903	3,214	1,006
6.	100	68.6	49.7	81.9	15.8	80.1	61.9	35.6
7.	756	4,133	1,880	442	85	7,874	2,395	842
8.	61	54,090	58,073	6,425	82,677	55,748	36,097	55,941
9.	61	11,851	3,608	596	1,043	12,607	9,909	2,351
10.	12,402	126	79	120	9	199	144	51
11.	12,402	392	158	947	107	706	324	427.90
12.	4	4	8	--	4	15	17	5
13.	3,024	5,657	5,671	--	648	40,343	9,933	2,465
14.	508	2,078	1,046	425	387	7,015	1,610	995
15.	.67	.30	.22	.55	.54	.63	.31	.35
16.	.67	.38	.37	.66	1.00	.76	.48	.61
17.	.67	.44	.45	.67	3.45	.79	.50	.98
18.	.67	.50	.55	.96	4.55	.89	.67	1.18
19.	8,328	38	18	66	5	126	45	18
20.	8,328	175	290	713	371	581	163	423
21.	41	16,492	13,241	3,542	43,000	32,250	11,181	19,510
22.	41	5,301	6,620	449	3,617	9,936	4,970	2,336
23.	.16	.36	.18	--	.59	.17	.16	.40
24.	-10.1	-7.0	-6.5	$\frac{1-0}{0}$	-6.2	-9.1	-12.1	-9.7

* AQCR not along county lines.

** No counties; made up of townships.

	Kansas	Kentucky	Louisiana	Maine	Maryland	Mass.	Michigan	Minn.
1. (a)	2,246	3,218	3,640	993	3,922	5,689	8,875	3,805
(b)	2,249	3,230	3,652	997	3,939	5,704	8,899	3,816
2. (a)	2,395	3,462	4,092	1,043	4,916	6,439	10,314	4,367
(b)	2,334	3,372	3,975	1,016	4,782	6,277	10,031	4,245
3.	1,485	1,684	2,406	504	3,004	4,810	6,554	2,257
4.	66.1	52.4	66.1	50.9	76.6	84.6	73.8	59.3
5.	949	1,288	1,996	214	3,307	4,818	6,806	2,165
6.	42.3	40	54.8	21.6	84.3	84.7	76.7	56.9
7.	785	1,120	1,703	171	2,588	4,334	5,569	1,902
8.	81,787	39,650	44,930	30,920	9,891	7,826	58,817	79,289
9.	2,997	3,203	6,207	352	3,239	2,606	10,664	9,901
10.	28	81	81	32	397	727	156	48
11.	181	402	321	607	1,020	848	638	219
12.	6	6	2	1	6	11	6	4
13.	2,879	3,409	5,602	327	8,698	16,443**	9,259	5,953
14.	1,055	1,506	602	300	2,814	1,963	3,485	1,162
15.	.46	.46	.16	.30	.71	.34	.39	.31
16.	.71	.89	.25	.59	.93	.40	.53	.46
17.	1.11	1.16	.28	1.40	.85	.40	.51	.54
18.	1.34	1.34	.35	1.75	1.08	.45	.62	.61
19.	13	38	13	10	285	251	61	15
20.	352	470	97	852	869	753	327	117
21.	37,688	18,593	7,432	9,375	7,088	2,700	22,342	24,217
22.	5,829	3,746	1,875	494	2,759	2,315	5,463	5,308
23.	.36	.44	.10	.91	.32	.11	.38	.20
24.	-1.5	-10.1	-16.7	-6.6	-5.3	-7.5	-7.6	-8.2

* AQCR not along county lines.

** No counties; made up of townships.

	Miss.	Missouri	Montana	Nebraska	Nevada	New Hamp.	N. Jersey	N.Mexico
1. (a)	2,216	4,676	694	1,482	488	737	7,168	1,016
(b)	2,223	4,685	698	1,489	493	742	7,197	1,022
2. (a)	2,308	5,201	741	1,614	693	902	8,514	1,124
(b)	2,245	5,070	721	1,570	673	878	8,300	1,088
3.	987	3,278	371	913	395	416	6,373	709
4.	44.5	70.1	53.6	61.6	80.9	56.5	88.9	70
5.	393	2,997	169	634	394	202	5,511	316
6.	17.7	64.1	24.4	42.8	80.7	27.3	76.9	31.1
7.	320	2,576	142	588	336	174	6,078	297
8.	47,296	68,995	145,587	76,483	109,889	9,027	7,521	121,412
9.	2,261	6,913	5,303	2,382	14,249	174	2,472	1,169
10.	47	68	5	19	4	82	953	8
11.	173.8	433	32	266	27	1,160	2,229	270
12.	--	1	1	--	1	2	8	6
13.	--	1,764	154	--	152	1,258	26,311	1,246
14.	653	2,280	567	389	501	285	3,767	755
15.	.29	.48	.81	.26	1.02	.38	.52	.74
16.	.66	.69	1.52	.42	1.26	.68	.59	1.06
17.	1.66	.76	3.35	.61	1.27	1.41	.68	2.38
18.	2.04	.88	3.99	.66	1.49	1.63	.61	2.54
19.	14	33	4	5	5	32	501	6
20.	389	330	107	163	35	1,638	1,524	646
21.	13,894	33,529	113,400	20,474	125,250	3,476	3,953	94,375
22.	5,780	15,266	17,719	1,462	18,556	246	1,690	2,796
23.	--	1.29	3.68	--	3.29	.22	.14	.60
24.	-10.3	-3.5	-7.0	-1.9	-2.3	-2.9	-11.4	+2.0

* AQCR not along county lines.

** No counties; made up of townships.

	Miss.	Missouri	Montana	Nebraska	Nevada	New Hamp.	N. Jersey	N.Mexico
1. (a)	2,216	4,676	694	1,482	488	737	7,168	1,016
(b)	2,223	4,685	698	1,489	493	742	7,197	1,022
2. (a)	2,308	5,201	741	1,614	693	902	8,514	1,124
(b)	2,245	5,070	721	1,570	673	878	8,300	1,088
3.	987	3,278	371	913	395	416	6,373	709
4.	44.5	70.1	53.6	61.6	80.9	56.5	88.9	70
5.	393	2,997	169	634	394	202	5,511	316
6.	17.7	64.1	24.4	42.8	80.7	27.3	76.9	31.1
7.	320	2,576	142	588	336	174	6,078	297
8.	47,296	68,995	145,587	76,483	109,889	9,027	7,521	121,412
9.	2,261	6,913	5,303	2,382	14,249	174	2,472	1,169
10.	47	68	5	19	4	82	953	8
11.	173.8	433	32	266	27	1,160	2,229	270
12.	--	1	1	--	1	2	8	6
13.	--	1,764	154	--	152	1,258	26,311	1,246
14.	653	2,280	567	389	501	285	3,767	755
15.	.29	.48	.81	.26	1.02	.38	.52	.74
16.	.66	.69	1.52	.42	1.26	.68	.59	1.06
17.	1.66	.76	3.35	.61	1.27	1.41	.68	2.38
18.	2.04	.88	3.99	.66	1.49	1.63	.61	2.54
19.	14	33	4	5	5	32	501	6
20.	389	330	107	163	35	1,638	1,524	646
21.	13,894	33,529	113,400	20,474	125,250	3,476	3,953	94,375
22.	5,780	15,266	17,719	1,462	18,556	246	1,690	2,796
23.	--	1.29	3.68	--	3.29	.22	.14	.60
24.	-10.3	-3.5	-7.0	-1.9	-2.3	-2.9	-11.4	+2.0

* AQCR not along county lines.

** No counties; made up of townships.

	New York	N.Carolina	N.Dakota	Ohio	Oklahoma	Oregon	Pa.	Rhode Is.
1.(a)	18,236	5,082	617	10,652	2,559	2,091	11,793	948
(b)	18,260	5,096	620	10,667	2,567	2,102	11,816	951
2.(a)	20,275	5,624	618	11,987	2,858	2,482	12,444	1,053
(b)	19,789	5,482	600	11,675	2,787	2,421	12,157	1,027
3.	15,602	2,285	273	8,026	1,740	1,403	8,430	825
4.	85.6	45	44.3	75.3	68	67	71.5	87
5.	15,771	1,896	74	8,273	1,231	1,281	9,366	802
6.	86.5	37.3	11.9	77.7	50.1	61.2	79.4	84.7
7.	14,267	1,212	53	6,642	1,049	984	6,921	745
8.	47,831	48,798	69,273	40,975	68,782	96,184	44,966	1,049
9.	15,408	7,295	1,749	13,933	7,011	10,113	13,467	705
10.	381	104	9	260	37	22	262	905
11.	1,023	260	42	594	182	126	695	1,137
12.	12	6	--	18	4	3	10	4
13.	56,476	3,493	--	21,089	3,092	4,422	29,244	3,784
14.	15,075	1,855	100	6,072	754	1,588	4,740	223
15.	.82	.36	.16	.57	.29	75	.40	.23
16.	.96	.81	.36	.76	.43	1.13	.56	.27
17.	.95	.97	1.35	.73	.58	1.23	.50	.27
18.	1.05	1.53	1.88	.91	.71	1.61	.68	.29
19.	318	38	1	148	11	17	105	213
20.	978	254	57	436	143	157	352	316
21.	39,567	17,837	11,111	23,353	20,378	72,182	18,092	246
22.	14,736	7,135	2,381	10,222	4,143	12,603	6,820	196
23.	.26	.53	--	.29	.24	.35	.16	.05
24.	-8.9	-5.1	-6.4	-11.7	-2.2	-3.8	-7.6	-9.8

* AQCR not along county lines.

** No counties; made up of townships.

	S.Carolina	S.Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington
1.(a)	2,590	665	3,923	11,195	1,059	444	4,648	3,409
(b)	2,597	668	3,938	11,241	1,066	447	4,660	3,414
2.(a)	2,806	677	4,367	13,180	1,275	518	5,369	4,061
(b)	2,731	658	4,259	12,812	1,234	504	5,229	3,958
3.	1,232	297	2,305	8,921	851	143	2,935	2,476
4.	47.6	44.6	58.8	79.8	80.6	32.2	63.1	72.6
5.	1,017	95	1,918	8,234	822	--	2,846	2,249
6.	39.3	14.3	48.9	73.5	77.6	--	61.2	66
7.	649	76	1,488	6,917	733	--	2,397	1,873
8.	30,225	75,955	41,328	262,134	82,096	9,267	39,780	66,570
9.	4,808	813	5,125	38,099	3,656	--	2,563	7,663
10.	86	9	95	43	13	48	117	51
11.	211	116	374	216	273	--	1,110	293
12.	7	--	7	13	4	--	**10	9
13.	1,915	--	5,125	15,475	3,372	--	9,746	7,695
14.	993	81	1,802	6,087	428	272	1,707	2,478
15.	.38	.12	.45	.54	.40	.61	.36	.72
16.	.80	.27	.78	.68	.50	1.90	.58	1.00
17.	.97	.85	.93	.73	.52	--	.59	1.10
18.	1.53	1.06	1.21	.88	.58	--	.71	1.32
19.	33	1	44	23	5	29	43	37
20.	207	100	352	160	117	--	660	323
21.	11,547	9,000	18,968	141,558	32,923	5,667	14,590	48,588
22.	4,706	698	4,818	28,181	1,568	--	1,538	8,457
23.	.51	--	.35	.39	.12	--	.17	.32
24.	-4.5	-8.2	-5.9	+0.8	+3.8	-6.1	-6.5	-1.6

* AQCR not along county lines.

** No counties; made up of townships.

	W.Virginia	Wisconsin	Wyoming
1.(a)	1,744	4,418	332
(b)	1,749	4,429	334
2.(a)	1,672	5,071	352
(b)	1,634	4,930	342
3.	679	2,910	201
4.	39	65.9	60.4
5.	545	2,543	--
6.	31.3	57.6	--
7.	679	2,067	
8.	24,070	54,464	97,203
9.	1,799	6,947	--
10.	72	81	3
11.	302	366	--
12.	5	4	--
13.	1,027	3,715	--
14.	972	1,479	125
15.	.55	.33	.37
16.	1.43	.51	.62
17.	1.78	.58	--
18.	1.43	.72	--
19.	40	27	1
20.	540	213	--
21.	13,500	18,254	41,667
22.	3,219	4,040	--
23.	.94	.40	--
24.	-7.5	-10.5	+5.0

* AQCR not along county lines.

** No counties; made up of townships.

To facilitate implementation of the system the Workbook consolidates all tables and figures referenced in the report that are needed to calculate values and scores for all measures. These tables should be retained as originals, and duplicated when needed to implement the system.

The Workbook is organized in the following manner:

1) For all measures, worksheets referenced in the text;
2) For each index,
    a) "State Values" output format, on which values computed on the worksheets are presented (this may be the end product desired or may be used to facilitate scoring);
    b) "Converting Values to Scores" table, on which ranges of values for each scoring interval are determined;
    c) "Scoring and Weighting" table for a single state, on which values computed for a state on the appropriate worksheets are converted to scores according to the ranges established on the "Converting Values to Scores" table;
    d) "State Scores" output format, on which computed scores are presented;
3) For all measures, "State Scores for All Indices and Sub-Indices" output format, which summarizes scores for all measures on the two highest levels of aggregation.

Worksheet #1. AMBIENT AIR QUALITY IMPROVEMENT

Region	Poll.-Std:						Poll.-Std:					
State		Previous Pd.		Present Pd.		(J) 1._.1._.		Previous Pd.		Present Pd.		(J) 1._.1._.
AQCR #	(G)	(H)	(I)	(H)	(I)	(a) or (b)	(G)	(H)	(I)	(H)	(I)	(a) or (b)

Instructions for Worksheet #1 Ambient Air Quality Improvement

1. List region number, state name, and AQCR code numbers on worksheet #1.
2. Refer to the Monitoring and Trends Report for the previous and present periods for each pollutant-standard.
    a. For each pollutant standard, determine stations that reported the appropriate values in both periods by matching station code numbers; list the number of stations reporting in both years in column(G).
    b. For TSP, SO_2, and NO_2 annual standards, compute column(I) sum of percentage deviations above each primary standard (given in Appendix II-D) in both periods for the state, which is equal to:

$$\sum^{AQCR} \sum^{SES} \frac{\text{annual mean - annual standard}}{\text{annual standard}}$$

where $\sum^{SES}$ = sum over all stations in an AQCR with an annual mean exceeding the standard

and $\sum^{AQCR}$ = sum over all AQCRs in the state.

(If there are too few stations with sufficient data to calculate annual means, the 50th and 70th percentile values are rough estimates of the TSP annual geometric mean and SO_2 annual arithmetic mean, respectively.)

    c. For short-term standards (TSP and SO_2 24-hour, CO 8-hour and 1-hour, and O_x 1-hour), col. (I) for each period is equal to:

$$\sum^{AQCR} \sum^{SES} \left[\frac{\left(\begin{array}{c}\text{\# of values for each}\\ \text{station exceeding std.}\end{array}\right) \times 100}{\text{(total \# of values)}}\right] \left[\frac{\left(\begin{array}{c}\text{2nd highest value}\\ \text{for each station}\end{array}\right) - \text{(Std.)}}{\text{(Std.)}}\right]$$

where $\sum^{SES}$ = sum over all stations in an AQCR with 2 or more values exceeding the standard,

and $\sum^{AQCR}$ = sum over all AQCRs in a state.

(Note: The number of values exceeding the standard is multiplied by 100 only to avoid numbers with a large number of decimal places.)

d. If there are no deviations above standard in the state in one or both periods, sum all annual means(for long-term standards) or 2nd highest values(for short-term standards) in the state for col(H).

e. If the state total for column(I) is greater than 0 in both periods, compute column(J) for percentage improvement in air quality deviation and label resulting value as (a):

$$\frac{\text{Previous Period (I) - Present Period (I)}}{\text{Previous Period (I)}} \times 100.$$

f. If the state total for column(I) is less than or equal to 0 in either period, compute column(J) for percentage improvement in air quality and label resulting value as (b):

$$\frac{\text{Previous Period (H) - Present Period (H)}}{\text{Previous Period (H)}} \times 100.$$

Worksheet #2. EMISSIONS

Pollutant:

Region State	(1) Previous Period Emissions (T/yr) (from NEDS)	(2) Present Period Emissions (T/yr) (from NEDS) (4.2.5._.)	(3) Emission Goal (T/yr) (from SIP Automated Information System)	(4) % of Needed Emissions Attained $\left[\frac{(1)-(2)}{(3)-(1)} \times 100\right]$ (1._.2.)	(5) Emission Reduction Needed (T/yr) [(3)-(2)] (4.3._.)

Worksheet #3. PRMS

(Data from PRMS Analytical Summary Report,
Appendix B, Analytical Site Summary)

Pollutant:

Region State	Number of Stations with Data Ending in the Present Period that Are:			
	INC (Insufficient)	-- (Adequate)	* (Mag. or Freq.) (All Deficiencies) (1._.3.)	Sufficient = Adequate + Deficiencies

Worksheet #4. SOURCE COMPLIANCE & ENFORCEMENT

(from State Activity Report on MBO Outputs)

Region:

Measure	STATES:				
Sub-Index 2.1.					
2.1.1.1. (1a)					
2.1.1.2. (1b)					
2.1.1.3. (1c)					
2.1.1.4. (1a + d)					
2.1.1.5. (1a+d+e+f)					
2.1.1.6. (1f)					
2.1.1.7. (1g(1))					
2.1.1.8. (1h(1))					
Total # Sources:					
Start					
Com.					
Mile.					
Last					
New					
Sub-Index 2.2.					
2.2.1.					
2.2.2.					
Sub-Index 3.1.					
3.1.1.					
3.1.2.					

Worksheet #4. SOURCE COMPLIANCE & ENFORCEMENT

(continued)

Region:

	STATES:				
Sub-Index 5.1.					
5.1.1.					
5.1.2.					
5.1.3.					
Sub-Index 2.3.					
2.3.1.					
2.3.2.					
2.3.3.					
2.3.4.1.					
2.3.4.2.					
2.3.4.3.					
Indicator 5.1.4.					

INSTRUCTIONS FOR WORKSHEET #4 SOURCE COMPLIANCE & ENFORCEMENT

1. List region number (no more than one per page) and states in region on Worksheet #4.
2. Refer to State Activity Report covering desired period, compute measures, and fill in for each state:

Start = Start Level
Com. = Commitment for the Year
Mile. = Milestones = Commitment for the Period
Last = Last Output Achievement for the Period
A/I = Activity Indicator

Sub-Index 2.1.*

2.1.1.1. (1a, Point Sources In Compliance with Emission Requirements)

$$\frac{\text{Last-Start}}{\text{Mile.-Start}} \times 100$$

2.1.1.2. (1b, Pt. Sources of Unknown Compliance Status)

$$\frac{\text{Start-Last}}{\text{Start-Mile.}} \times 100$$

2.1.1.3. (1c, Pt. Sources Out of Compliance & Not on Schedule)

$$\frac{\text{Start-Last}}{\text{Start-Mile.}} \times 100$$

2.1.1.4. (1a+d, Pt. Sources In Compliance With Emission Requirement or With Scheduled Increments of Progress)

$$\frac{\text{Last-Start}}{\text{Mile-Start}} \times 100 = \frac{(\text{1a Last} + \text{1d Last}) - (\text{1a Start} + \text{1d Start})}{(\text{1a Mile.} + \text{1d Mile.}) - (\text{1a Start} + \text{1d Start})} \times 100$$

2.1.1.5. (1a+d+e+f, Pt. Sources in Compliance with Emission Requirements or On Compliance Schedules)

$$\frac{\text{Last-Start}}{\text{Mile-Start}} \times 100$$

2.1.1.6. (1f, Pt. Sources of Unknown Status Regarding Increments of Progress)

$$\frac{\text{Start-Last}}{\text{Start-mile.}} \times 100$$

2.1.1.7. (1g(1), Field Surveillance Actions by State)

$$\frac{\text{Last}}{\text{Mile.}} \times 100$$

2.1.1.8. (1h(1), Enforcement Actions by State)

$$\frac{\text{Last}}{\text{Mile.}} \times 100$$

Total # of Sources (1a+b+c+d+e+f)

Start

Com.

Mile.

Last

New=Last-Start

Sub-Index 2.2.*

2.2.1. $\frac{(\text{1a Last} + \text{1d Last}) - (\text{1a Start} + \text{1d Start})}{\text{1b} + \text{1c} + \text{1e} + \text{1f Start}}$

2.2.2. $\frac{(\text{1b Start} - \text{1b Last}) + (\text{1f Start} - \text{1f Last})}{\text{1b Start} + \text{1f Start}}$

Sub-Index 3.1.

3.1.1. $\frac{\text{1a Last} + \text{1d Last}}{\text{Total Last}}$

3.1.2. $\frac{\text{1d} + \text{1e} + \text{1f Last}}{\text{Total Last-1a Last}}$

Sub-Index 5.1.

5.1.1. 1b Last + 1f Last

5.1.2. 1c Last

5.1.3. 1e Last

Sub-Index 2.3.**

2.3.1. $\frac{\text{1g(1)-A/I 1b(2) Source Tests by State}}{\text{\# of D \& B Manufacturing Facilities in State(see 5.1.4. below)}}$

2.3.2. $\frac{\text{A/I 1b(2)}}{\text{\# of D \& B Manufacturing Facilities in State(see 5.1.4. below)}}$

2.3.3. $\frac{\text{1g(1) Last}}{\text{1g(1)+(2) Last}}$

2.3.4.1. $\frac{\text{A/I 1c(1)+(2)}}{\text{1c Start +1e Start}}$

2.3.4.2. $\frac{\text{A/I 1d(1)+(2)}}{\text{1c Start + 1e Start}}$

2.3.4.3. $\frac{\text{A/I 1e(1)+(2)}}{\text{1c Start + 1e Start}}$

3. Refer to Dun & Bradstreet Dun Market Identifiers (DMI) File and fill in for each state:

5.1.4. Number of Manufacturing facilities in each state.

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* If commitment (denominator) is 0, the measure is assigned a value on the following basis: 0/0=1.0, 1/0=2.0, 2/0=3.0, etc.

** If the number of sources (denominator) is 0, no value is computed for the measure.

Worksheet #5a. MONITORING AND REPORTING

Pollutant:

Region
STATE
AQCR #
	(1)-(2)
	=(3)
	Tot(4)
	Tot(5)
		(6)	(6)-(2)
			=(7)
				If(3)≥0,
				$\frac{(7)}{(3)}$ =(8)
				If(3)≤0,
				NN
					(9)
					Tot(10)
					2.4._.1.=
					$\frac{(9)Tot}{Tot(5)}$
						(1)-(6)
						=(11)
						Tot(11)
						5.2._.1.
						Tot(12)
						Tot(13)
						5.2. .2.
							Tot(14) 3.2._.2. = $\frac{Tot(12)}{Tot(15)}$
							Tot(16) 2.4._.2. = $\frac{Tot-Tot\ (12)\ (4)}{Tot(5)}$
								(17)=$\frac{(6)}{(1)}$	(18)
									Tot(19)
									3.2._.1.
										Tot (22) =
										$\frac{(20)}{(20)+(21)}$
										3.2. .3.

Instructions for Worksheet #5a Monitoring and Reporting

For each pollutant:

A. Refer to Monitoring and Trends Report for the previous period.

  1. Fill in pollutant name, region number, state name, and AQCR code numbers.

  2. For each AQCR:

     Column (1), minimum required (MR) # of stations -
     column (2) # of stations that reported in the previous period =
     column (3) # of stations needed to be added (with + or - sign).

  3. For state total:

     a. Tot.(4) = # of AQCRs in the state with column (3) value less than or equal to 0 (i.e., that had complete networks).

     b. Tot.(5) = # of AQCRs in the state with (3) greater than 0 (i.e., that had fewer than the MR # of stations).

B. Refer to Monitoring and Trends Report for present period.

  1. For each AQCR:

     a. Column (6) = # of stations that reported in the present period.

     b. (6) - (2) = (7) # of stations added from the previous to the present period (with + or - sign).

     c. If the value in column (3) is greater than 0, column (8) % of needed stations that were needed = (7)/(3) (with + or - sign).

     d. If (3) $\leq$ 0, fill in NN for none needed, in column (8).

e. If column (8) ≥ 1, column (9) = 1.00.

f. If (8) < 1, (9) = (8).

g. If (8) is NN, (9) is NN.

2. For state total:

$$\text{Tot.(10)(2.4.-.1.)} = \frac{\text{sum of values in col.(9)}}{\text{Tot.(5)}}$$

or = NN if all AQCRs in the state have NN in col.(8).

3. For each AQCR:

Col.(1) - col.(6) = col.(11) # of stations needed in present period (with + or - sign).

4. For state total:

a. Tot.(11)(5.2.-.1.) = total # of stations needed in the state in the present period = sum of positive values in col.(11) for all AQCRs in the state.

b. Tot.(12) = # of AQCRs in the state with the minimum required network reporting = # of AQCRs with col.(11) value ≤ 0.

c. Tot.(13)(5.2.-.2.) = # of AQCRs in the state with less than the minimum required network reporting = # of AQCRs with (11) > 0.

d. Tot.(14)(3.2.-.2.) % of AQCRs in the state with the MR

$$\text{network} = \frac{\text{Tot.(12)}}{\text{Tot.(15) total \# of AQCRs in the state}} .$$

e. Tot.(16)(2.4.-.2.) % of the state's AQCRs needing stations in the previous period that attained the complete MR network =

$$\frac{\text{Tot.(12) - Tot.(4)}}{\text{Tot.(5)}} .$$

(If Tot.(5) = 0, fill in NN.)

5. For each AQCR:

   a. Col.(17) % of MR # of stations reporting in the present period = $\frac{(6)}{(1)}$.

      (If (1) = 0, (17) = 1.00.)

   b. If the value in col.(17) $\geq$ 1.00, col.(18) = 1.00.

   c. If (17) < 1.00, (18) = (17).

6. For state total:

   a. Tot.(19)(3.2.-.1.) = $\frac{\text{sum of col.(18) for all AQCRs in the state}}{\text{(15) total \# of AQCRs in the state}}$.

C. Refer to Air Quality Data-Annual Statistics for the present period (frequency distributions). Determine pollutants for which data using unacceptable pollutant methods (see Appendix II-C) were reported for any state during the present period. For state total:

$$\left[\begin{array}{l}\text{Col.(22)(3.2.\_.3.)}\\ \text{\% of methods reported}\\ \text{that were acceptable}\end{array}\right] = \left[\frac{\text{(20) \# of stations using acceptable (FRM, equivalent, or unapproved) methods}}{\text{(20) + (21) \# of stations using unacceptable methods}}\right]$$

Worksheet #5b. SAROAD SUFFICIENCY SCORE

(from AEROS Status Report, Summary of Monitoring Activity)

Pollutant:

Region State	(1) # of Station-Quarters That Do Not Meet SAROAD Sufficiency Criteria	(2) # of Station Quarters That Do Meet SAROAD Sufficiency Criteria	(3) SAROAD Sufficiency Score $\left[\frac{(2)}{(1)+(2)} \times 100\right]$ (2.4.1.3.)	(4) Improvement Needed in Score [100 - (3)] (5.2.1.3.)

Worksheet #6. EMISSIONS REPORTING

Region State	(1) # of Sources in NEDS	(2) # of Sources on NEDS Verification File (5.2.6.1.)	(3) % of Possible Sources in NEDS $\left(1-\frac{(1)}{(2)}\right) \times 100$ (3.2.6.1.)	(4) Total Possible # of Necessary NEDS Data Items in Present Pd.	(5) # of Necessary Data Items Missing in Present Period (5.2.6.2.)	(6) % of Necessary Data Items Missing in Present Period $\frac{(5)}{(4)} \times 100$ (3.2.6.2.)	(7) # of Items Missing in Previous Period	(8) # Completed During Period (7)-(5)	(9) % of Missing Items Completed $\frac{(8)}{(7)} \times 100$ (2.4.5.1.)

Instructions for Worksheet #6 Emissions Reporting

1. Refer to list of number of sources in NEDS and on NEDS Verification File for desired period and fill in columns (1) and (2) on worksheet #6 for each state. Compute column (3):

$$\left(1 - \frac{\text{Column (1)}}{\text{Column (2)}}\right) \times 100$$

2. Refer to AEROS Status Report, NEDS (Section I), Point Source Inventory-Incomplete Data Items, covering present period.
   a. Cross out unnecessary data items in each state (see Section A, p. II-20 of this report for data items declared necessary)
   b. Compute column (4) total possible number of necessary data items (sum of # of necessary items times # of plants/points/processes):

$$\begin{array}{r} 4 \times \text{\# of plants} \\ 51 \times \text{\# of points} \\ + \; 7 \times \text{\# of processes} \\ \hline \text{Total \#} \end{array}$$

   c. Count # of necessary data items missing in each state and fill in under column (5) (5.2.6.2.).
   d. Compute percentage of necessary data items that are missing:

$$\frac{\text{Column (5)}}{\text{Column (4)}} \times 100$$; and fill in under column (6)(3.2.6.2.).

3. Refer to AEROS Status Report for previous period.
   a. Cross out unnecessary data items in each state.
   b. Count # of necessary data items missing in each state and fill in under column (7).
   c. Compute net number of items completed:

      Column (7) - Column (5)

      and fill in under column (8).
   d. Compute % of items missing in previous period that were completed:

$$\frac{\text{Column (8)}}{\text{Column (7)}} \times 100$$

      and fill in under column (9).

Worksheet #7. COMPLETING PLANS AND REVISIONS

(from SIP Progress Report)

Region State	(1) # of AQCRs in State	(2) # of SIP Portions	(3) Total Possible # of SIP Portions [(1)x(2)]	(4) # Declared Deficient			(5) # Counted as Deficient [(4a) x (1) + (4b)]	(6) # Completed [(3)-(5)]	(7) % Completed [$\frac{(6)}{(3)}$ x 100] (3.3.1.)
				(a) State-wide Plans	(b) AQCR Plans	(c) Total (5.3.1.)			

Worksheet #8. AIR QUALITY DEVIATION INDICATION

Region	Poll.-Std.				Poll.-Std.			
State AQCR #	(A)/(B)	(C)	(D)	(E) (4.1._._.)	(A)/(B)	(C)	(D)	(E) (4.1._._.)

Instructions for Worksheet #8 Air Quality Deviation Indication

1. List region number, state name, and AQCR code numbers on worksheet #8.

2. Refer to Monitoring and Trends Report for present period. For each AQCR and each pollutant-standard:

   a. Column(A) = federal minimum required number of stations.

   b. Column(B) = number of stations that reported in the present period.

   c. Column(C) = column(A) ÷ column(B).

   (For AQCRs with MR # = 0, (C) is computed thus: 0/0 = 1.0, 1/0 = 2.0, 2/0 = 3.0, etc.)

3. Column(D) = sum of percentage deviations above standard:

   a. For annual standards (TSP, SO_2, NO_2), refer to Trends Report;

   $$(D) = \sum^{SES} \frac{\text{annual mean - annual standard}}{\text{annual standard}}$$

   where $\sum^{SES}$ = sum over all stations with annual means exceeding standard.

   (If too few annual means are available, the 50th and 70th percentile values of frequency distributions can be substituted for the TSP annual geometric mean and the SO_2 and NO_2 annual arithmetic means, respectively. Refer to Air Quality Data-Annual Statistics for frequency distributions.)

   b. For short-term standards (TSP, SO_2, CO, O_x), (D) =

   $$\sum^{SES} \sum^{VES} \frac{\text{value - standard}}{\text{standard}}$$

   where $\sum^{VES}$ = sum over all values exceeding the standard

   and $\sum^{SES}$ = sum over all stations with 2 or more values exceeding the standard.

(If short term values are not available, the following equation can be substituted:

$$\sum^{SES} \left[\frac{(\#\text{ of values exceeding std.}) \times 100}{(\text{total }\#\text{ of values})}\right] \left[\frac{(2\text{nd highest value}) - (\text{std.})}{\text{standard}}\right]$$

where $\sum^{SES}$ = sum over all stations in an AQCR with 2 or more values exceeding the standard.)

c. For the state total, values in column(D) are summed.

4. Column(E) = corrected sum of percentage deviations above standard:

a. The value of (D) for each AQCR can be corrected to account for the percentage completion of the federal minimum required network. For each AQCR: $(E) = \frac{(D)}{(C)}$.

b. For the state total, values in column(E) are summed.

Worksheet #9. POPULATION EXPOSED TO AIR QUALITY DEVIATION

Region State AQCR #	Poll.-Std.:		Poll.-Std.:		Poll.-Std.:		State % of Interstate AQCR Population
	√ if AQDI >0	Population (State Total = 4.1._._.)	√ if AQDI >0	Population (State Total = 4.1._._.)	√ if AQDI >0	Population (State Total = 4.1._._.)	

Instructions for Worksheet #9. Population Exposed to Air Quality Deviation

1. List region number, state name, and AQCR code numbers on worksheet #9. Fill in pollutant-standards.
2. Refer to worksheet #8. Air Quality Deviation Indication. If a particular AQCR has an AQDI (column(D) or (E) on worksheet #8) greater than 0, check appropriate column on worksheet #9 for that pollutant-standard and AQCR. If AQDI $\leq$ 0, leave blank.
3. Enter population of AQCR with checked AQDI column on worksheet #9. For AQCR population, refer to NADB printout. If dates on printout are inconsistent and a more consistent set of figures is desired, refer to OBERS 1970 population by AQCR. For interstate AQCR, compute from NADB printout approximate percentage of total AQCR population in a given state and fill in on worksheet #9. Multiply this percentage by total AQCR population from OBERS to obtain state-AQCR population.
4. Total population of checked AQCRs in a state is the population in a state exposed to air quality deviation of each pollutant-standard.

Worksheet #10. EMISSION SOURCES

Region	(1)	(2)	(3) Total Population (1000)			(4) OBERS Prod. Indexes for All Mfg. (1969=100)	
State	Urbanized Area Pop. (1000) (4.2.1.)	SMSA Land Area (Sq. Mi.) (4.2.2.)	(a) Base Year	(b) Projection Year =	(c) Growth Rate (4.2.3.)	(a) Projection Year	(b) Growth Rate (4.2.4.)

STATE VALUES FOR INDEX 1

	1. GOAL ATTAINMENT																									
	1.1. TSP						1.2. SO_2						1.3. CO						1.4. O_x				1.5. NO_2			
	1.1.1. AAQI						1.2.1. AAQI						1.3.1. AAQI						1.4.1. AAQI				1.5.1. AAQI			
STATE	1.1.1.1.(a)>Annual	1.1.1.1.(b)≤Annual	1.1.1.1.(a)>24-Hour	1.1.1.2.(b)≤24-Hour	1.1.2. Em. Reduction	1.1.3 PRMS Flags (# of Stns. Analyzed)	1.2.1.1.(a)>Annual	1.2.1.1.(b)≤Annual	1.2.1.2.(a)>24-Hour	1.2.1.2.(b)≤24-Hour	1.2.2. Em. Reduction	1.2.3. PRMS Flags (# of Stns. Analyzed)	1.3.1.1.(a)>8-Hour	1.3.1.1.(b)≤8-Hour	1.3.1.2.(a)>1-Hour	1.3.1.2.(b)≤1-Hour	1.3.2. Em. Reduction	1.3.3. PRMS Flags (# of Stns. Analyzed)	1.4.1.1.(a)>1-Hour	1.4.1.1.(b)≤1-Hour	1.4.2. Em. Reduction	1.4.3. PRMS Flags (# of Stns. Analyzed)	1.5.1.1.(a)>Annual	1.5.1.1.(b)≤Annual	1.5.2. Em. Reduction	1.5.3. PRMS Flags (# of Stns. Analyzed)

Converting Values to Scores
Index 1. GOAL ATTAINMENT

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
AQ Deviation Improvement Sub-Indicators								
1.1.1.1.(a)TSP								
1.1.1.2.(a)TSP								
1.2.1.1.(a)SO_2								
1.2.1.2.(a)SO_2								
1.3.1.1.(a)CO								
1.3.1.2.(a)CO								
1.4.1.1.(a)O_x								
1.5.1.1.(a)NO_2								
AQ Improvement Sub-Indicators								
1.1.1.1.(b)TSP								
1.1.1.2.(b)TSP								
1.2.1.1.(b)SO_2								
1.2.1.2.(b)SO_2								
1.3.1.1.(b)CO								
1.3.1.2.(b)CO								
1.4.1.1.(b)O_x								
1.5.1.1.(b)NO_2								
Emission Reduction								
Indicators:								
1.1.2. TSP								
1.2.2. SO_2								
1.3.2. CO								
1.4.2. HC								
1.5.2. NO_2								
PRMS								
Indicators:								
1.1.3. TSP								
1.2.3. SO_2								
1.3.3. CO								
1.4.3. O_x								
1.5.3. NO_2								

Scoring and Weighting
Index 1. GOAL ATTAINMENT

STATE:

REGION:

Measure	Sub-Indicator Value Score Wt. Wtd. Score	Indicator Value Score Wt. Wtd. Score	Sub-Index Score Wt. Wtd. Score	Index Score
1.1.1.1.(a)				
1.1.1.1.(b)				
1.1.1.2.(a)				
1.1.1.2.(b)				
1.1.1.AAQI				
1.1.2.E.R.				
1.1.3.PRMS				
1.1.TSP				
1.2.1.1.(a)				
1.2.1.1.(b)				
1.2.1.2.(a)				
1.2.1.2.(b)				
1.2.1.AAQI				
1.2.2.E.R.				
1.2.3.PRMS				
1.2.SO$_2$				
1.3.1.1.(a)				
1.3.1.1.(b)				
1.3.1.2.(a)				
1.3.1.2.(b)				
1.3.1.AAQI				
1.3.2.E.R.				
1.3.3.PRMS				
1.3.CO				
1.4.1.1.(a)				
1.4.1.1.(b)				
1.4.1.AAQI				
1.4.2.E.R.				
1.4.3.PRMS				
1.4.O$_x$/HC				
1.5.1.1.(a)				
1.5.1.1.(b)				
1.5.1.				
1.5.2.				
1.5.3.				
1.5.NO$_2$				
1.GOAL ATTAINMENT				

STATE SCORES FOR INDEX 1

(1)	Index																							
(2)	Sub-Indices																							
(3)	Indicators							(%)	Indicators							(%)	Indicators							(%)
(4)	Sub-Indi.				(%)	(%)	(%)		Sub-Indicator				(%)	(%)	(%)		Sub-Indi.				(%)	(%)	(%)	
(Weights)	(%)		(%)						(%)		(%)						(%)		(%)					
STATE	1.1.1.1.(a)>TSP Annual	1.1.1.1.(b)≤TSP Annual	1.1.1.2.(a)>TSP 24-Hour	1.1.1.2.(b)≤TSP 24-Hour	1.1.1. TSP AAQ Improvement	1.1.2. TSP Em. Reduction	1.1.3. TSP PRMS Flags (# of Stns. Analyzed)	1.1. TSP Goal Attainment	1.2.1.1.(a)>SO_2 Annual	1.2.1.1.(b)≤SO_2 Annual	1.2.1.2.(a)>SO_2 24-Hour	1.2.1.2.(b)≤SO_2 24-Hour	1.2.1. SO_2 AAQ Improvement	1.2.2. SO_2 Em. Reduction	1.2.3. SO_2 PRMS Flags (# of Stns. Analyzed)	1.2. SO_2 Goal Attainment	1.3.1.1.(a)>CO 8-Hour	1.3.1.1.(b)≤CO 8-Hour	1.3.1.2.(a)>CO 1-Hour	1.3.1.2.(b)≤CO 1-Hour	1.3.1. CO AAQ Improvement	1.3.2. CO Em. Reduction	1.3.3. CO PRMS Flags (# of Stns. Analyzed)	1.3. CO Goal Attainment
(1)																								
(2)																								
(3)																								
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STATE SCORES FOR INDEX 1 (Continued)

(1)	Index												
(2)	Sub-Indices												
(3)	Indicators						Indicators						
(4)	S/I						S/I						
(Weights)	(100%)		(%)	(%)	(%)	(%)	(100%)		(%)	(%)	(%)	(%)	
STATE	1.4.1.1.(a)$>O_x$ 1-Hour	1.4.1.1.(b)$\leq O_x$ 1-Hour	1.4.1. O_x AAQ Improvement	1.4.2. O_x Em. Reduction	1.4.3. O_x PRMS Flags (# of Stns. Analyzed)	1.4. O_x Goal Attainment	1.5.1.1.(a)$>NO_2$ Annual	1.5.1.1.(b)$\leq NO_2$ Annual	1.5.1. NO_2 AAQ Improvement	1.5.2. NO_2 Em. Reduction	1.5.3. NO_2 PRMS Flags (# of Stns. Analyzed)	1.5. NO_2 Goal Attainment	1. GOAL ATTAINMENT
(1)													
(2)													
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(3)													
(4)													

STATE VALUES FOR INDEX 2

	2. PROCESS															
	2.4. Monitoring and Reporting Air Quality and Emissions															
	2.4.1. TSP			2.4.2. SO_2			2.4.3. CO			2.4.4. O_x			2.4.5. NO_2			2.4.6. Ems.
TATE	2.4.1.1. % of Needed Stations Added	2.4.1.2. % of Needed AQCRs Attained	2.4.1.3. SAROAD Sufficiency Score	2.4.2.1. % of Needed Stations Added	2.4.2.2. % of Needed AQCRs Attained	2.4.2.3. SAROAD Sufficiency Score	2.4.3.1. % of Needed Stations Added	2.4.3.2. % of Needed AQCRs Attained	2.4.3.3. SAROAD Sufficiency Score	2.4.4.1. % of Needed Stations Added	2.4.4.2. % of Needed AQCRs Attained	2.4.4.3. SAROAD Sufficiency Score	2.4.5.1. % of Needed Stations Added	2.4.5.2. % of Needed AQCRs Attained	2.4.5.3. SAROAD Sufficiency Score	2.4.6.1. % of Missing NEDS Data Items Completed

STATE VALUES FOR INDEX 2 (Continued)

	2. PROGRESS															
	2.1. Meeting Commitments								2.2. Source Compl.		2.3. Surveillance and Enforcement					
	2.1.1. Source Compliance													2.3.4. Enf. Actions		
STATE	2.1.1.1. Output 1a	2.1.1.2. Output 1b	2.1.1.3. Output 1c	2.1.1.4. Output 1a + d	2.1.1.5. Output 1a, d - f	2.1.1.6. Output 1f	2.1.1.7. Output 1g(1)	2.1.1.8. Output 1h(1)	2.2.1. Non-Complying Sources Brought into Compliance	2.2.2. Unknown Sources Whose Status was Determined	2.3.1. Process Inspection, Opacity Observation	2.3.2. Stack Tests	2.3.3. Field Surveillance by State	2.3.4.1. Notices of Violation	2.3.4.2. Abatement Orders	2.3.4.3. Court Proceedings

Converting Values to Scores
Index 2. PROGRESS

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
MBO Commitments								
Sub-Indicators:								
2.1.1.1.								
2.1.1.2.								
2.1.1.3.								
2.1.1.4.								
2.1.1.5.								
2.1.1.6.								
2.1.1.7.								
2.1.1.8.								
Source Compliance								
Indicators:								
2.2.1.								
2.2.2.								
Surveillance & Enforcement Actions								
Indicators:								
2.3.1.								
2.3.2.								
2.3.3.								
Enforcement								
Sub-Indicators:								
2.3.4.1.								
2.3.4.2.								
2.3.4.3.								

Converting Values to Scores
Index 2. PROGRESS (continued)

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score= 1) Low to:	(Score= 2) to:	(Score= 3) to:	(Score= 4) to:
Monitoring & Reporting								
% of Needed Stations Added Sub-Indicators:								
2.4.1.1.								
2.4.2.1.								
2.4.3.1.								
2.4.4.1.								
2.4.5.1.								
% of Needed AQCRs Attained Sub-Indicators:								
2.4.1.2.								
2.4.2.2.								
2.4.3.2.								
2.4.4.2.								
2.4.5.2.								
SAROAD Sufficiency Score								
Sub-Indicators:								
2.4.1.3.								
2.4.2.3.								
2.4.3.3.								
2.4.4.3.								
2.4.5.3.								
Emissions Rptg.								
Sub-Indicator:								
2.4.6.1.								

Scoring and Weighting
Index 2. PROGRESS

STATE: **REGION:**

Measure	Sub-Indicator Value Score Wt. Wtd. Score	Indicator Value Score Wt. Wtd. Score	Sub-Index Score Wt. Wtd. Score	Index Score
2.1.1.1.				
2.1.1.2.				
2.1.1.3.				
2.1.1.4.				
2.1.1.5.				
2.1.1.6.				
2.1.1.7.				
2.1.1.8.				
2.1.1.				
2.1.Meeting Com.				
2.2.1.				
2.2.2.				
2.2. Source Compl.				
2.3.1.				
2.3.2.				
2.3.3.				
2.3.4.1.				
2.3.4.2.				
2.3.4.3.				
2.3.4.				
2.3.Surv. & Enf.				
2.4.1.1.				
2.4.1.2.				
2.4.1.3.				
2.4.1.TSP				
2.4.2.1.				
2.4.2.2.				
2.4.2.3.				
2.4.2.SO_2				
2.4.3.1.				
2.4.3.2.				
2.4.3.3.				
2.4.3.CO				
2.4.4.1.				
2.4.4.2.				
2.4.4.3.				
2.4.4.O_x				
2.4.5.1.				
2.4.5.2.				
2.4.5.3.				
2.4.5.NO_2				
2.4.6.1.				
2.4.6.Em.				
2.4.Monitoring				
2.PROGRESS				

STATE SCORES FOR INDEX 2

(1)	Index												
(2)	Sub-Indices												
(3)	Indicators										Indicators		
(4) (Weights)	Sub-Indicators												
STATE	2.1.1.1. Output 1a (%)	2.1.1.2. Output 1b (%)	2.1.1.3. Output 1c (%)	2.1.1.4. Output 1a + d(%)	2.1.1.5. Output 1a,d-f(%)	2.1.1.6. Output 1f (%)	2.1.1.7. Output 1g(1) (%)	2.1.1.8. Output 1h(1) (%)	2.1.1. Source Compliance (100%)	2.1. Meeting MBO Commitments (%)	2.2.1. Non-Complying Sources Brought into Compl. (%)	2.2.2. Unknown Sources Whose Status was Determined (%)	2.2. Source Compliance (%)
(1)													
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(3)													
(4)													
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(3)													
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(4)													

STATE SCORES FOR INDEX 2 (Continued)

(1)	Index															
(2)	Sub-Indices															
(3)	Indicators								Indicators							
(4) (Weights)	(%)	(%)	(%)	Sub-Indicators			(%)	(%)	Sub-Indicators			(%)	Sub-Indicators			(%)
				(%)	(%)	(%)			(%)	(%)	(%)		(%)	(%)	(%)	
STATE	2.3.1. Process Insp., Opacity Obs.	2.3.2. Stack Tests	2.3.3. Field Surv. by State	2.3.4.1. Notices of Violation	2.3.4.2. Abatement Orders	2.3.4.3. Court Proceedings	2.3.4. Enforcement Actions	2.3. Surveillance & Enf.	2.4.1.1. % of Needed Stns. Added	2.4.1.2. % of Needed AQCRs Attained	2.4.1.3. SAROAD Sufficiency Score	2.4.1. TSP Monitoring	2.4.2.1. % of Needed Stns. Added	2.4.2.2. % of Needed AQCRs Attained	2.4.2.3. SAROAD Sufficiency Score	2.4.2. SO_2 Monitoring
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STATE SCORES FOR INDEX 2 (Continued)

(1)	Index															
(2)	Sub-Indices															
(3)	Indicators															
(4)	Sub-Indicators				Sub-Indicators				Sub-Indicators				$^S/_I$			
(Weights)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(100%)	(%)	(%)	
STATE	2.4.3.1. % of Needed Stns. Added	2.4.3.2. % of Needed AQCRs Attained	2.4.3.3. SAROAD Sufficiency Score	2.4.3. CO Monitoring	2.4.4.1. % of Needed Stns. Added	2.4.4.2. % of Needed AQCRs Attained	2.4.4.3. SAROAD Sufficiency Score	2.4.4. O_x Monitoring	2.4.5.1. % of Needed Stns. Added	2.4.5.2. % of Needed AQCRs Attained	2.4.5.3. SAROAD Sufficiency Score	2.4.5. NO_2 Monitoring	2.4.6.1. % of NEDS Missing Data Items Completed	2.4.6. Emissions Rptg.	2.4. Monitoring & Reporting AQ & Emissions	2. PROGRESS
(1)																
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(3)																
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8 (4)																

STATE VALUES FOR INDEX 3

	3. ACHIEVEMENT									
	3.2. Monitoring & Reporting Air Quality & Emissions (continued)									3.3. Completing Plans & Revisions
	3.2.4. O_x Monitoring			3.2.4. NO_2 Monitoring			3.2.6. Emissions Reporting			
STATE	3.2.4.1. % of MR Stns	3.2.4.2. % of AQCRs w/ Complete Network	3.2.4.3. % of Pollutant Method Not Unacceptable	3.2.5.1. % of MR Stns	3.2.5.2. % of AQCRs w/ Complete Network	3.2.5.3. % of Pollutant Method Not Unacceptable	3.2.6.1. % of Sources on NEDS	3.2.6.2. % of NEDS Data Items Missing	3.3.1. % of SIP Portions Completed

STATE VALUES FOR INDEX 3 (Continued)

	3. ACHIEVEMENT											
	3.1. Source Compliance		3.2. Monitoring & Reporting Air Quality & Emissions									
			3.2.1. TSP Monitoring			3.2.2. SO_2 Monitoring			3.2.3. CO Monitoring			
STATE	3.1.1. % of Sources in Compliance	3.1.2. % of Non-Complying Sources on Schedule	3.2.1.1. % of MR Stns	3.2.1.2. % of AQCRs with Complete Network	3.2.1.3. % of Pollutant-Methods Not Unacceptable	3.2.2.1. % of MR Stns	3.2.2.2. % of AQCRs with Complete Network	3.2.2.3. % of Pollutant-Methods Not Unacceptable	3.2.3.1. % of MR Stns	3.2.3.2. % of AQCRs with Complete Network	3.2.3.3. % of Pollutant-Methods Not Unacceptable	

Converting Values to Scores
Index 3. ACHIEVEMENT

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
Source Compliance Indicators: 3.1.1. 3.1.2.								
Monitoring & Reporting % of Required stations Sub-Indicators: 3.2.1.1. 3.2.2.1. 3.2.3.1. 3.2.4.1. 3.2.5.1.								
% of AQCRs Sub-Indicators: 3.2.1.2. 3.2.2.2. 3.2.3.2. 3.2.4.2. 3.2.5.2.								
Pollutant-Methods Sub-Indicators: 3.2.1.3. 3.2.2.3. 3.2.3.3. 3.2.4.3. 3.2.5.3.								
Emissions Rptg. Sub-Indicators: 3.2.6.1. 3.2.6.2.								
Completing Plans Indicator: 3.3.1.								

Scoring and Weighting
Index 3. ACHIEVEMENT

STATE: **REGION:**

Measure	Sub-Indicator Value Score Wt. Wtd. Score	Indicator Value Score Wt. Wtd. Score	Sub-Index Score Wt. Wtd. Score	Index Score
3.1.1.				
3.1.2.				
3.1. Source Compl.				
3.2.1.1.				
3.2.1.2.				
3.2.1.3.				
3.2.1. TSP				
3.2.2.1.				
3.2.2.2.				
3.2.2.3.				
3.2.2. SO_2				
3.2.3.1.				
3.2.3.2.				
3.2.3.3.				
3.2.3. CO				
3.2.4.1.				
3.2.4.2.				
3.2.4.3.				
3.2.4. O_x				
3.2.5.1.				
3.2.5.2.				
3.2.5.3.				
3.2.5. NO_2				
3.2.6.1.				
3.2.6.2.				
3.2.6.				
3.2. Monitoring				
3.3.1.				
3.3. Completing Plans				
3. ACHIEVEMENT				

STATE SCORES FOR INDEX 3

(1)	Index														
(2)	Sub-Indices														
(3)	Indicators			Indicators											
(4)				Sub-Indicators				Sub-Indicators				Sub-Indicators			
Weights)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
STATE	3.1.1. % of Sources In Compliance	3.1.2. % of Non-Complying Sources on Schedule	3.1. Source Compliance	3.2.1.1. % of MR Stns	3.2.1.2. % of AQCRs with Complete Network	3.2.1.3. % of Pollutant Methods Not Unacceptable	3.2.1. TSP Monitoring	3.2.2.1. % of MR Stns	3.2.2.2. % of AQCRs with Complete Network	3.2.2.3. % of Pollutant Methods Not Unacceptable	3.2.2. SO_2 Monitoring	3.2.3.1. % of MR Stns	3.2.3.2. % of AQCRs with Complete Network	3.2.3.3. % of Pollutant Methods Not Unacceptable	3.2.3. CO Monitoring
(1)															
(2)															
(3)															
(4)															
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STATE SCORES FOR INDEX 3 (Continued)

(1)	Index														
(2)	Sub-Indices														
(3)	Indicators												Ind.		
(4)	Sub-Indicators				Sub-Indicators				Sub-Ind.						
(Weights)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
STATE	3.2.4.1. % of MR Stns	3.2.4.2. % of AQCRs with Complete Network	3.2.4.2. % of Pollutant Methods Not Unacceptable	3.2.4. O_x Monitoring	3.2.5.1. % of MR Stns	3.2.5.2. % of AQCRs with Complete Network	3.2.5.3. % of Pollutant Methods Not Unacceptable	3.2.5. NO_2 Monitoring	3.2.6.1. % of Sources on NEDS	3.2.6.2. % of NEDS Data Items Missing	3.2.6. Emissions Reporting	3.2. Monitoring & Reporting AQ & Emissions	3.3.1. % of SIP Portions Completed	3.3. Completing Plans & Revisions	3. ACHIEVEMENT
(1)															
(2)															
(3)															
(4)															
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STATE VALUES FOR INDEX 4

STATE	4. PROBLEM																							
	4.1. Ambient Air Quality Problem																							
	4.1.1. TSP						4.1.2. SO_2						4.1.3. CO						4.1.4.O_x			4.1.5.NO_2		
	4.1.1.1.(a) Annual, Corr.	4.1.1.1.(b) Annual, Uncorr.	4.1.1.2.(a) 24-Hour, Corr.	4.1.1.2.(b) 24-Hour, Uncorr.	4.1.1.3. Exposed Pop. (Annual)	4.1.1.4. Exposed Pop. (24-Hour)	4.1.2.1.(a) Annual, Corr.	4.1.2.1.(b) Annual, Uncorr.	4.1.2.2.(a) 24-Hour, Corr.	4.1.2.2.(b) 24-Hour, Uncorr.	4.1.2.3. Exposed Pop. (Annual)	4.1.2.4. Exposed Pop. (24-Hour)	4.1.3.1.(a) 8-Hour, Corr.	4.1.3.1.(b) 8-Hour, Uncorr.	4.1.3.2.(a) 1-Hour, Corr.	4.1.3.2.(b) 1-Hour, Uncorr.	4.1.3.3. Exposed Pop. (8-Hour)	4.1.3.4. Exposed Pop. (1-Hour)	4.1.4.1.(a) 1-Hour, Corr.	4.1.4.1.(b) 1-Hour, Uncorr.	4.1.4.2. Exposed Pop. (1-Hour)	4.1.5.1.(a) Annual, Corr.	4.1.5.1.(b) Annual, Uncorr.	4.1.5.2. Exposed Pop. (Annual)

STATE VALUES FOR INDEX 4 (Continued)

	4. PROBLEM													
	4.2. Emissions & Em. Sources									4.3. Reduc. Needed				
					4.2.5. Emissions									
STATE	4.2.1. Urban Pop.	4.2.2. Urbanized Land Area	4.2.3. Pop. Growth Rate	4.2.4. Manu. Growth Rate	4.2.5.1. TSP	4.2.5.2. SO_2	4.2.5.3. CO	4.2.5.4. HC	4.2.5.5. NO_2	4.3.1. TSP	4.3.2. SO_2	4.3.3. CO	4.3.4. HC	4.3.5. NO_2

Converting Values to Scores
Index 4. PROBLEM

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
AAQ Problem								
AQDI								
Sub-Indicators:								
4.1.1.1. (a)TSP								
4.1.1.1. (b)TSP								
4.1.1.2. (a)TSP								
4.1.1.2. (b)TSP								
4.1.2.1. (a)SO_2								
4.1.2.1. (b)SO_2								
4.1.2.2. (a)SO_2								
4.1.2.2. (b)SO_2								
4.1.3.1. (a)CO								
4.1.3.1. (b)CO								
4.1.3.2. (a)CO								
4.1.3.2. (b)CO								
4.1.4.1. (a)O_x								
4.1.4.1. (b)O_x								
4.1.5.1. (a)NO_2								
4.1.5.1. (b)NO_2								
Population (1000)								
Sub-Indicators:								
4.1.1.3. TSP								
4.1.1.4.								
4.1.2.3. SO_2								
4.1.2.4.								
4.1.3.3. CO								
4.1.3.4.								
4.1.4.2. O_x								
4.1.5.2. NO_2								

Converting Values to Scores
Index 4. PROBLEM (continued)

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
Emissions & Em. Sources								
Indicators:								
4.2.1. Pop.								
4.2.2. Land								
4.2.3. Pop.Gr.								
4.2.4. Manu.Gr.								
Emissions (1000T/yr)								
Sub-Indicators:								
4.2.5.1. TSP								
4.2.5.2. SO_2								
4.2.5.3. CO								
4.2.5.4. HC								
4.2.5.5. NO_x								
Emission Reduction Needed								
Indicators:								
4.3.1. TSP								
4.3.2. SO_2								
4.3.3. CO								
4.3.4. HC								
4.3.5. NO_x								

(a) = Corrected
(b) = Uncorrected

Scoring and Weighting
Index 4. PROBLEM

STATE:

REGION:

Measure	Sub-Indicator Value Score Wt. Wtd. Score	Indicator Value Score Wt. Wtd. Score	Sub-Index Score Wt. Wtd. Score	Index Score
4.1.1.1.				
4.1.1.2.				
4.1.1.3.				
4.1.1.4.				
4.1.1.TSP				
4.1.2.1.				
4.1.2.2.				
4.1.2.3.				
4.1.2.4.				
4.1.2.SO_2				
4.1.3.1.				
4.1.3.2.				
4.1.3.3.				
4.1.3.4.				
4.1.3.CO				
4.1.4.1.				
4.1.4.2.				
4.1.4.O_x				
4.1.5.1.				
4.1.5.2.				
4.1.5.NO_2				
4.1.AAQ Problem				
4.2.1.				
4.2.2.				
4.2.3.				
4.2.4.				
4.2.5.1.				
4.2.5.2.				
4.2.5.3.				
4.2.5.4.				
4.2.5.5.				
4.2.5.				
4.2.Em & Em. Sources				
4.3.1.				
4.3.2.				
4.3.3.				
4.3.4.				
4.3.5.				
4.3.Em. Reduc. Needed				
4.PROBLEM				

STATE SCORES FOR INDEX 4

(1) Index

(2) Sub-Indices

(3) Indicators

STATE	4.1.1.1.1.(a) Annual, Corr.	4.1.1.1.1.(b) Annual, Uncorr.	4.1.1.1.2.(a) 24-Hour, Corr.	4.1.1.1.2.(b) 24-Hour, Uncorr.	4.1.1.1.3. Exposed Pop. (Annual)	4.1.1.1.4. Exposed Pop. (24-Hr.)	4.1.1. TSP	4.1.2.1.(a) Annual, Corr.	4.1.2.1.(b) Annual, Uncorr.	4.1.2.2.(a) 24-Hour, Corr.	4.1.2.2.(b) 24-Hour, Uncorr.	4.1.2.3. Exposed Pop. (Annual)	4.1.2.4. Exposed Pop. (24-Hr.)	4.1.2. SO_2	4.1.3.1.(a) 8-Hour, Corr.	4.1.3.1.(b) 8-Hour, Uncorr.	4.1.3.2.(a) 1-Hour, Corr.	4.1.3.2.(b) 1-Hour, Uncorr.	4.1.3.3. Exposed Pop. (8-Hr.)	4.1.3.4. Exposed Pop. (1-Hr.)	4.1.3. CO	4.1.4.1.(a) 1-Hour, Corr.	4.1.4.1.(b) 1-Hour, Uncorr.	4.1.4.2. Exposed Pop. (1-Hr.)	4.1.4. O_x	4.1.5.1.(a) Annual, Corr.	4.1.5.1.(b) Annual, Uncorr.	4.1.5.2. Exposed Pop. (Annual)	4.1.5. NO_2
(4)	Sub-Indi.							Sub-Indi.							Sub-Indi.							S/I				S/I			
(Weights)	(%)		(%)		(%)	(%)	(%)	(%)		(%)		(%)	(%)	(%)	(%)		(%)		(%)	(%)	(%)	(%)		(%)	(%)	(%)		(%)	(%)
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STATE SCORES FOR INDEX 4. (Continued)

(1)	Index																		
(2)	Sub-Indices																		
(3)		Indicators											Indicators						
(4)						Sub-Indicators													
(Weights)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
STATE	4.1. AAQ Problem	4.2.1. Urban Pop.	4.2.2. Urbanized Land Area	4.2.3. Pop. Growth Rate	4.2.4. Manu. Growth Rate	4.2.5.1. TSP	4.2.5.2. SO_2	4.2.5.3. CO	4.2.5.4. HC	4.2.5.5. NO_2	4.2.5. Emissions	4.2. Em. & Emission Sources	4.3.1. TSP	4.3.2. SO_2	4.3.3. CO	4.3.4. HC	4.3.5. NO_2	4.3. Em. Reduction Needed	4. PROBLEM
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(3)																			
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STATE VALUES FOR INDEX 5

	5. OPERATIONAL REQUIREMENTS								
	5.2. Monitoring and Reporting Air Quality and Emissions								5.3. Comp. Plans & Revisions
	5.2.4. O_x			5.2.5. NO_2			5.2.6. Emissions Reporting		
STATE	5.2.4.1. # of Stations Needed	5.2.4.2. # of AQCRs With Less Than Required Network	5.2.4.3. Improvement Needed in Sufficiency Score	5.2.5.1. # of Stations Needed	5.2.5.2. # of AQCRs With Less Than Required Network	5.2.5.3. Improvement Needed in Sufficiency Score	5.2.6.1. Sources on NEDS Verification File	5.2.6.2. Missing NEDS Data Items	5.3.1. Needed SIP Portions

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STATE VALUES FOR INDEX 5 (Continued)

STATE	5. OPERATIONAL REQUIREMENTS												
	5.1. Source Compliance & Enforcement				5.2. Monitoring and Reporting Air Quality and Emissions								
					5.2.1. TSP			5.2.2. SO_2			5.2.3. CO		
	5.1.1. Unknown Sources	5.1.2. Non-Complying Sources Not on Compl. Schedule	5.1.3. Overdue Sources	5.1.4. Sources that Require Field Surveillance	5.2.1.1. # of Stations Needed	5.2.1.2. # of AQCRs With Less Than Required Network	5.2.1.3. Improvement Needed in Sufficiency Score	5.2.2.1. # of Stations Needed	5.2.2.2. # of AQCRs With Less Than Required Network	5.2.2.3. Improvement Needed in Sufficiency Score	5.2.3.1. # of Stations Needed	5.2.3.2. # of AQCRs With Less Than Required Network	5.2.3.3. Improvement Needed in Sufficiency Score

Converting Values to Scores
Index 5. OPERATIONAL REQUIREMENTS

Measures	Range of Values Used		No. of States	Scale A=Arith. G=Geom.	Value Ranges for Scoring Intervals			
	Low	High			(Score=) Low to:	(Score=) to:	(Score=) to:	(Score=) to:
Source Compliance & Enforcement								
Indicators:								
5.1.1.								
5.1.2.								
5.1.3.								
5.1.4.								
Monitoring & Reporting								
No. of Needed Stations								
Sub-Indicators:								
5.2.1.1.								
5.2.2.1.								
5.2.3.1.								
5.2.4.1.								
5.2.5.1.								
No. of AQCRs								
Sub-Indicators:								
5.2.1.2.								
5.2.2.2.								
5.2.3.2.								
5.2.4.2.								
5.2.5.2.								
Improvement in SAROAD score								
Sub-Indicators:								
5.2.1.3.								
5.2.2.3.								
5.2.3.3.								
5.2.4.3.								
5.2.5 3.								
Emissions Rptg.								
Sub-Indicators:								
5.2.6.1.								
5.2.6.2.								
Completing Plans								
Indicator:								
5.3.1.								

Scoring and Weighting
Index 5. OPERATIONAL REQUIREMENTS

STATE: **REGION:**

Measure	Sub-Indicator Value Score Wt. Wtd. Score	Indicator Value Score Wt. Wtd. Score	Sub-Index Score Wt. Wtd. Score	Index Score
5.1.1.				
5.1.2.				
5.1.3.				
5.1.4.				
5.1. Source Compl.				
5.2.1.1.				
5.2.1.2.				
5.2.1.3.				
5.2.1. TSP				
5.2.2.1.				
5.2.2.2.				
5.2.2.3.				
5.2.2. SO$_2$				
5.2.3.1.				
5.2.3.2.				
5.2.3.3.				
5.2.3. CO				
5.2.4.1.				
5.2.4.2.				
5.2.4.3.				
5.2.4. O$_x$				
5.2.5.1.				
5.2.5.2.				
5.2.5.3.				
5.2.5. NO$_2$				
5.2.6.1.				
5.2.6.2.				
5.2.6. Em.				
5.2. Monitoring				
5.3.1.				
5.3. Completing Plans				
5. OPERATIONAL REQUIREMENTS				

STATE SCORES FOR INDEX 5

(1)	Index																
(2)	Sub-Indices																
(3)	Indicators				(%)	Indicators											
(4)						Sub-Indi.			(%)	Sub-Indi.			(%)	Sub-Indi.			(%)
(Weights)	(%)	(%)	(%)	(%)		(%)	(%)	(%)		(%)	(%)	(%)		(%)	(%)	(%)	
STATE	5.1.1. Unknown Sources	5.1.2. Non-Complying Sources Not on Compl. Schedule	5.1.3. Overdue Sources	5.1.4. Sources That Require Field Surveillance	5.1. Source Compliance & Enforcement	5.2.1.1. # of Stations Needed	5.2.1.2. # of AQCRs With Less Than Required Network	5.2.1.3. Improvement Needed in Sufficiency Score	5.2.1. TSP	5.2.2.1. # of Stations Needed	5.2.2.2. # of AQCRs With Less Than Required Network	5.2.2.3. Improvement Needed in Sufficiency Score	5.2.2. SO_2	5.2.3.1. # of Stations Needed	5.2.3.2. # of AQCRs With Less Than Required Network	5.2.3.3. Improvement Needed in Sufficiency Score	5.2.3. CO
(1)																	
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STATE SCORES FOR INDEX 5 (Continued)

(1)	Index														
(2)	Sub-Indices														
(3)	Indicators												Ind.		
(4)	Sub-Indi.				Sub-Indi.				Sub-Indi.						
(Weights)															
STATE	5.2.4.1. # of Stations Needed (%)	5.2.4.2. # of AQCRs With Less Than Required Network (%)	5.2.4.3. Improvement Needed in Sufficiency Score (%)	5.2.4. O_x (%)	5.2.5.1. # of Stations Needed (%)	5.2.5.2. # of AQCRs With Less Than Required Network (%)	5.2.5.3. Improvement Needed in Sufficiency Score (%)	5.2.5. NO_2 (%)	5.2.6.1. Sources on NEDS Verification File (%)	5.2.6.2. Missing NEDS Data Items (%)	5.2.6. Emissions Reporting (%)	5.2. Monitoring & Reporting (%)	5.3.1. Needed SIP Portions (%)	5.3. Completing Plans & Revisions (%)	5. OPERATIONAL REQUIREMENTS
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STATE SCORES FOR ALL INDICES AND SUB-INDICES

(1)	Indices																						
(2)	Sub-Indices						Sub-Indices					Sub-Indices				Sub-Indices				Sub-Indices			
	( )	( )	( )	( )	( )		( )	( )	( )	( )		( )	( )	( )		( )	( )	( )		( )	( )	( )	
STATE	1.1. TSP	1.2. SO_2	1.3. CO	1.4. O_x	1.5. NO_2	1. GOAL ATTAINMENT	2.1. MBO Commitments	2.2. Source Compl.	2.3. Surveillance & Enf. Actions	2.4. Monit. & Rptg.	2. PROGRESS	3.1. Source Compl.	3.2. Monit. & Rptg.	3.3. Completing Plans	3. ACHIEVEMENT	4.1. AAQ Problem	4.2. Emissions & Em. Sources	4.3. E.R. Needed (Poll.-Specific)	4. PROBLEM	5.1. Source Compl. & Enf.	5.2. Monit. & Rptg.	5.3. Completing Plans	5. OPERATIONAL REQUIREMENTS
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